The National Council for the Recovery of Ukraine from the Consequences of the War

Draft Ukraine Recovery Plan

Materials of the “Audit of war damage” working group

July 2022

1. The main issues to be addressed in the Recovery Plan

In general, since the beginning of the war between russia and Ukraine, according to a quick analytical evaluation of the Kyiv School of Economics (hereinafter - KSE), the amount of direct documented damage to residential and non-residential real estate and other infrastructure as of June 13, 2022 amounted to more than $ 95.5 billion). Estimates of direct losses do not take into account the value of undamaged assets in the territories occupied after 24.02.2022 and the value of assets occupied and/or damaged before 24.02.2022.

The total indirect losses of Ukraine's economy are estimated at $ 126.8 billion or 3.7 trillion hryvnias.

According to the KSE team's evaluation, the total amount of needs for the reconstruction of Ukraine is $ 165.1 billion or almost 4.8 trillion hryvnias. At the same time, the assessment of the need for recovery does not take into account the total losses of the economy from the war (loss of GDP, investment, labor, etc.).

The total losses of Ukraine's economy due to the war, including both direct and indirect losses (GDP decline, investment cessation, labor outflows, additional defense and social support costs, etc.), range from $ 564 billion to $ 600 billion.

The main problem is to determine the amount of damages and the availability of all evidence for their proper compensation. As a result, the state will be able to determine losses, methods and objectives of assessment, to record evidence of losses properly; assess losses, store and use evidence and valuation results. The result of solving these issues will be as follows:

1. A unified conceptual approach and a methodology for determining losses, recording and storing information and evidence (depending on the purpose of the assessment) have been developed and implemented for state bodies, local self-government bodies, and stakeholders.

2. The state has information on the extent of destruction, indirect damage by industry and region, and has identified a financial need to restore damaged / destroyed assets for effective planning of its activities.

The methodological basis for determining losses is internationally recognized standards.

Key challenges in the field:

· Uncertainty of the ultimate objectives of the collection of information on losses and their assessment, as depending on the objectives of determining the amount of damage, different methods and approaches may be used;

· Lack of a unified approach to determining the amount and monetary value of losses incurred as a result of armed aggression, as well as responsible institutions in terms of damage assessment, because different authorities, NGOs, forensic experts determine losses based on their methods, which leads to different interpretations and certain amounts;

· Lack of a unified approach to the procedure for recording losses, which leads to social tension, chaotic actions, which in the future may cause outrage at the need to repeat certain procedures to obtain correct estimates, or lead to poor initial data for assessments;

· Lack of a single state electronic register (digital resource), where all data on losses and their assessment would be collected, accumulated and processed;

· Lack of the order for accounting data on damaged and destroyed things (movables, animals), while accounting for data on damaged and destroyed real estate (real estate, real estate) is provided by the resolution of the Cabinet of Ministers of Ukraine dated 26.03.2022 № 380 "On collection, processing and accounting for information on damaged and destroyed real estate as a result of hostilities, terrorist acts, sabotage caused by the military aggression of the russian federation. "

Key features:

· Subordination of the choice of approaches and methodology for assessing damages to the legal strategy for future claims against the aggressor state (for example, violation of the Convention on the Laws and Customs of Land Warfare of 18.10.1907; appeal to the Agreement between the Cabinet of Ministers of Ukraine and the Government of the Russian Federation investment of 27.11.1998, use of UN resolution A / RES / 60/147 or other options), as improper or incorrect preparation of evidence of damages may worsen Ukraine's position in the courts;

· Use at least two separate approaches to assess the amount of damage, namely: (1) preliminary (analytical) damage evaluation, which will be used mainly for crisis communication, policy assessments and a simplified methodology that can be used by ministries, other central and local executive authorities. However, these estimates will generally not be able to be used to pay compensation and cannot be considered as appropriate evidence in the courts; (2) detailed (object-by-object) assessment of damages, which will be carried out in accordance with the legislation on property valuation, land valuation, forensic examination, will be determined by experts with special qualifications and, unlike previous assessments, will be verified and have legal significance, and can be used for the following lawsuits (including in international courts and courts of other countries), compensation payments, etc.;

· The possibility, with the support of international technical assistance projects, to start creating a single information and communication geoinformation system and the State Register of Damage Caused by Armed Aggression - to record destruction and damage, including using a single cartographic basis, as well as remote zoning technologies for monitoring of mass damage and destruction.

Key constraints/framework:

· The main challenge for developing a recovery plan is the considerable uncertainty surrounding the lack of possible timelines when the war will end. There are several scenario plans to end the war (from the return to the borders of 1991/on 24.02.22 to the attempts of the Russian Federation to capture the entire territory of Ukraine and a significant number of options between them), which can significantly change the content and priorities of such a plan;

· It is very likely that the active phase of hostilities in the East and South-East of Ukraine will continue both during the work on the document and at the end of June - the expected period of presentation and approval of the plan. Estimates of the duration of this phase and the end of the war vary from a few months to several years.

2. Goals, objectives, stages of the Recovery Plan in the direction of "Audit of war losses"

2.1 Purpose - one or more generalized goals, proposed changes to solve problems in the area

A unified conceptual approach and action plan should be developed and implemented for state and local governments to identify the damage caused by the war, to unify the approaches and methods of such determination.

2.2 The main tasks indicating the necessary measures / steps for their implementation, divided into stages

· Setting loss targets and general approaches to achieving loss targets (in terms of each target);

· Identification of those responsible for the implementation of general approaches in terms of objectives;

· Unification of methodological support and digitalization of loss determination (including inventory, fixation of losses, determination of their volume, evaluation and storage of loss determination results);

· Identification of final executors of the processes of determining losses (inventory, recording of losses and their volume, assessment);

· Introduction of the main ways of coordination and interaction of state authorities and local self-government bodies in the processes related to the determination of losses;

· Establishing requirements for documents confirming the legality of damage due to war (elimination of falsified cases of damage not caused by hostilities) and belonging of the damages to the declared persons (documents confirming the right of ownership or use of destroyed / damaged property);

· Developing approaches to the possible preservation of destroyed / damaged objects with a view to their possible further use in lawsuits;

· Development of the necessary changes in the legislation to determine the terminology, rights and obligations of the parties, the peculiarities of the exercise of powers by public authorities, including the temporary management and storage of destroyed / damaged property.

Proposed national projects and relevant regulatory and legal support

Project description	Justification	Criteria / indicators of the proposal implementation (quantitative or qualitative)	The main responsible state body	Estimated need for financing (UAH million)	Proposed sources of funding	Regulatory and legal support
Creation of unique state information and communication system for the collection, accumulation, accounting, processing, storage and protection of information (documents) about damaged and destroyed property, spatial coordinates of objects, persons whose property is damaged or destroyed, damage and losses caused by the damage of such property, and other information, using a cartographic basis and information products of remote sensing of the Earth, in particular space photography.	The need to implement a unified approach to the collection, accumulation, accounting, processing, storage and protection of information (documents) about damaged and destroyed property, spatial coordinates of objects, persons whose property is damaged or destroyed, damage and losses caused by damage to such property, in order to carry out law enforcement activities, prepare lawsuits for international disputes, conduct assessments, manage recovery projects, as well as the queue for compensation / square meters, carry out analysis and public control over the recovery process.	Phase I (July 2022) - creation and implementation of the State Register of property damaged and destroyed as a result of hostilities, terrorist acts, sabotage caused by military aggression of the Russian Federation (MVP for real estate) Phase II - development of a business process for collecting and processing information on damaged and destroyed movable property Phase III - collection and processing of information about damaged and destroyed movable property in the information and communication system	Ministry of Infrastructure Ministry of Regional Development Ministry of Reintegration Ministry of digital transformation Ministry of Justice Ministry of Culture State Property Fund MIA SES local governments military administration	tbd	international technical assistance	Law of Ukraine, which, in particular, will provide for the creation and operation of a single register, which will accumulate and store all information and data on damages caused by armed aggression Procedure for maintaining the State Register of property damaged and destroyed as a result of hostilities, terrorist acts, sabotage caused by the military aggression of the russian federation Resolution of 26.03.2022 № 380 On the collection, processing and accounting of information on damaged and destroyed real estate as a result of hostilities, terrorist acts, sabotage caused by military aggression of the russian federation

Creation and filling of the Unified register of objects of the state and municipal property on single methodological bases in the order established by the Cabinet of Ministers of Ukraine	Today there is a Unified Register of State Property, the software of which is outdated. There is no single unified approach to the accounting of communal property. This situation complicates the comparison and identification with the objects that have suffered damage, as well as makes it impossible to work analytically with the relevant data. Purpose: to create on a single modern IT platform a centralized information resource (portal), which should unite all assets (enterprises, institutions, organizations and property) that belong to the state in terms of subjects of management of state property as well as of territorial communities.	Technical tasks for the new software are developed, the order of maintaining the register is approved, the software is developed and adjusted, digital data are collected and transferred to the Unified register	SCMU SPFU Ministry of digital transformation Ministry of Regional Development local governments Ministry of Economy Ministry of Finance Ministry of Justice State Geocadastre Ministry of Infrastructure Derzhkomstat, national securities commission	tbd	internatio nal technical assistance	Development and adoption of the Law of Ukraine on Amendments to the Laws of Ukraine “On Management of State Property” and “On Local Self-Government”, as well as the Law of Ukraine on Amendments to the Code of Ukraine on Administrative Offenses and the Criminal Procedure Code of Ukraine on improving the state policy of management of state and communal property (determination of liability for failure to enter information in the Unified Register). Development and adoption of Resolutions of the Cabinet of Ministers of Ukraine on the procedure for maintaining the Unified Register of State and Communal Property (to replace the resolutions of April 14, 2004 №467 “On approval of the Regulations on the Unified Register of State Property” and 30.11.2005 № 1121 “On approval of the Methodology conducting an inventory of state property ”)

DRAFT

REPORT ON DIRECT INFRASTRUCTURE DAMAGES, INDIRECT ECONOMIC LOSSES AND PRELIMINARY ASSESSMENT OF UKRAINE'S RECOVERY FINANCING NEEDS

Contents

Executive Summary

On February 24, 2022, an unprovoked full-scale Russian invasion of Ukraine took place. Since the beginning of the war, Ukraine's losses have been enormous: thousands of civilians have died, dozens of cities have been damaged, hundreds of infrastructure facilities, medical, social and educational institutions, enterprises, and thousands of homes have been destroyed.

Within the National Council for the Recovery of Ukraine, a preliminary assessment of Ukraine's damages, losses and recovery needs from the war with Russia was conducted.

This report presents the results of the assessment of the damages to Ukraine's physical assets; preliminary assessment of losses by sector breakdown, as well as preliminary assessment of the reconstructions and in part - of recovery needs (excluding additional needs for modernization, investment projects, etc.).

The report covers the period from February 24 to **June 13, 2022.**

This report covers only damages and reconstruction needs directly related to russia's military aggression, and **does not cover financial needs for modernizing Ukraine's economy.**

The total amount of Ukraine's recovery needs, as of June 13, 2022; breakdown by type of needs.

The damage assessment was carried out within the National Council for the Recovery of Ukraine by the Kyiv School of Economics (KSE) together with the Ministry of Communities and Territorial Development, coordinated by the Ministry for Reintegration of the Temporarily Occupied Territories and in cooperation with line ministries and the National Bank; the assessment of losses and preliminary reconstruction and recovery needs was carried out by the KSE team, taking into account contributions from central executive bodies.

The assessment of environmental losses was carried out by the team of the Ministry of Environmental Protection and Natural Resources, together with partners, according to its own methodology, and currently contains only certain/ fragmentary estimates of the financial costs of environmental damage caused to Ukraine as a result of hostilities.

The overall assessment of damages and losses under this report was carried out according to the World Bank methodology, and in close collaboration with the World Bank team, but taking into account the significant amount of microdata collected by relevant authorities after the full-scale war outbreak.

The assessment methodology involves the use of indirect methods, statistics and certain assumptions, in particular on the extent of damage in areas where active hostilities are still underway, physical inspection of which is limited due to danger (e.g. mining) or in areas occupied by the aggressor. To calculate the value of damaged and/ or destroyed assets, the average values calculated on the basis of data from the State Statistics Service, line ministries, Prozorro tenders, etc., and adjustment ratios according to the level of damage to objects are used. To calculate the value of damaged or destroyed assets of large industrial facilities, identified institutions, information from the financial statements as of the last available date is used.

At the same time, the receipt of information on the actual (compared to the preliminary assessment) state of damage to facilities in the liberated and controlled territories of Ukraine is used as a proxy to clarify assumptions about the level of damage and the extent of destruction.

The research methodology is described in more detail in the relevant section of this report.

Damages assessment

As of June 13, the total amount of damages to residential and non-residential real estate and other infrastructure **counts over $95.5bln or approximately UAH 2.6 trillion (at replacement cost).**

The largest share in the total damages belongs to residential buildings (39% or $36.8bln) and infrastructure (33% or $31.3bln). Damages of business assets amount to at least $8bln and are growing rapidly. Another $4.3bln is the damages of the agricultural sector.

Damage of public sector facilities (social facilities and institutions, educational, scientific and health care institutions, cultural, sports facilities, administrative buildings, etc.) amount to about $6.7bln.

Damages are estimated at the replacement cost (market value of an appropriate analogue that could be purchased before the military aggression, at the $/ UAH exchange rate as of December 31, 2021). Damages do not take into account undamaged assets in the territories occupied after 24.02.22 and the assets occupied and/ or damaged before 24.02.22.

The most affected are the regions of Ukraine in which direct hostilities took place: Donetsk (25% of damages in monetary terms), Kharkiv (18%), Luhansk (over 13%), Mykolaiv (9%), Zaporizhzhia (7%), Kyiv (7%) and Chernihiv (6%) regions.

Losses, by sector breakdown

The total preliminary assessment of losses of Ukraine's economy are $126.8bln or UAH 3.7 trillion (as of June 13, 2022).

Missile attacks cause great damage to industry, infrastructure and other assets. This leads to a complete or partial shutdown of a significant number of enterprises and institutions, which, in turn, results in significant indirect losses.

The largest share belongs to the business assets and industry – $28.7bln, the agri sector and land resources - $23.4bln. $ 23.3bln is indirect losses to trade.

This estimate does not take into account the total economic losses from the war (GDP decline, cessation of investment, outflow of labour force, additional defence and social support costs, etc.), which according to joint estimates of the Ministry of Economy and KSE, range from $564bln to $600bln.

Reconstruction and recovery needs

According to preliminary estimates, **Ukraine's reconstruction needs amount to $165.1bln or almost UAH 4.8 trillion**. This assessment **does not take into account the need to implement other modernization projects than related to the war time damages.**

The recovery needs include technological modernization and the principle ‘Build Back Better’ when rebuilding destroyed assets, and are assessed in prices and official $/ UAH exchange rate as of June 2022.

Ukraine's housing stock reconstruction needs are the biggest – $57.9bln. Another $41.8bln will be needed to rebuild infrastructure assets, at least $17.5bln – to restore full-fledged agricultural sector operations; $17bln – to restore the business assets and activities.

The assessment of reconstruction needs is preliminary and subject to further clarification. As the war is still going on, it is difficult to predict how many citizens will return to Ukraine and their regions of residence after the end of the war. This makes it difficult to forecast changes in the volume of demand for public services by region; the demand for the social infrastructure, etc. Recovery needs should also take into account the territorial development plans designing; energy balance forecast; prospects for development/ unblocking of trade routes, etc. Therefore, at the

moment there is no final vision of all sectoral development strategies to be assessed in the recovery needs.

Another limitation of the current assessment is that it does not take into account the damage caused by the war to the equipment of enterprises; additional measures to strengthen the institutional capacity of the authorities to support Ukraine's economic recovery; as well as total economic losses from the war (loss of GDP, investment, labour forces, etc.).

The comprehensive assessment of demining needs also yet needs to be made due to the limited information on the forestry, waterways' mining pollution, except modest estimates for the agricultural sector ($0.5bln) and tourism ($0.2bln). According to the World Bank's assessment, demining all territories (including forests, waterways) requires more than $70bln.

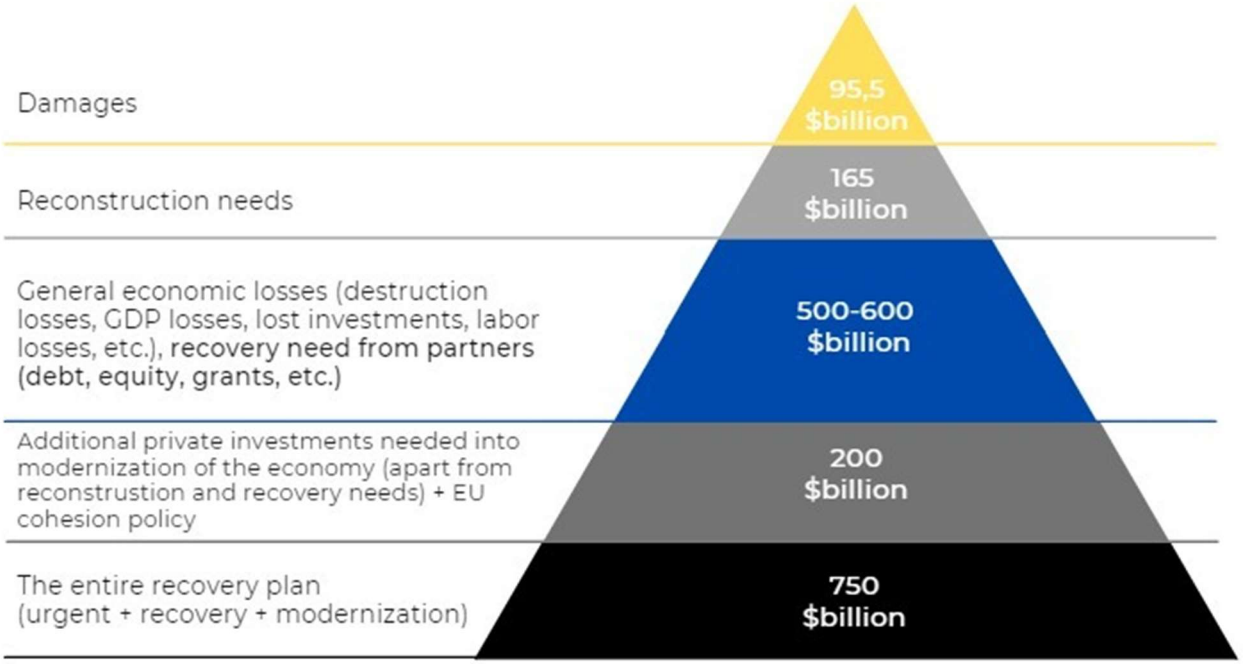
Thus, the total needs including demining are close to 235 $bln.

Damages, losses and reconstruction and recovery needs by sector breakdown, in monetary terms, as of June 13, 2022, $blns

Property type	Damages	Losses	Reconstruction and recovery needs
Housing	36.8	2.7	57.9
Transportation infrastructure	31.3	17.7	41.8
Industry and business services	8.0	28.0	16.8
Agri sector and land resources	4.3	23.4	17.5
Social services	0.2	6.4	6.6
Vehicles	2.3	0.2	4.6
Education	3.5	2.1	4.4
Commerce	2.1	23.3	3.9
Energy	1.8	11.6	3.5
Health care	1.5	2.7	2.3
Utilities	1.3	2.3	1.7
Culture, religion, sport, and tourism	0.7	4.3	1.6
Administrative buildings	0.9	0.1	1.3
Digital infrastructure	0.6	1.1	1.0

Financial sector	0.02	0.2	0.02
Total	**95.5**	**126.8**	**165.1**
Additional needs for demining			
Demining (according to the World Bank preliminary assessment)			**70**
Total, with demining			**235,1**

Chart 1. General needs for financial support of Ukraine, $ billion



Introduction

The war launched against Ukraine by the russian federation on February 24, 2022, became the largest military conflict in Europe since the World War II. The aggressor undertakes its standard methods of combat previously used in Syria and Chechnya with the maximum use of indiscriminate attacks, artillery and rocket fire on settlements, including the largest cities of Ukraine, as well as on critical and other infrastructure facilities.

This results in significant civilian casualties, both as a result of direct hostilities and numerous war crimes. According to the UN, as of June 14, 2022, 4,432 Ukrainians were officially killed and another 5,499 were injured. 288 children were killed and at least 527 were injured. Information on civilian casualties during the war has been delayed considerably and, in all likelihood, does not cover the number of casualties in the occupied territories and does not take into account the deaths of Ukrainian servicemen.

It also leads to large-scale destruction and damage to housing, office buildings, infrastructure facilities, cultural and architectural sites throughout the country, and especially in areas of active hostilities. In the first weeks of the war, in late February – early March, hostilities took place in 10 regions. As of the beginning of June 2022, hostilities continue in Kharkiv, Luhansk, Donetsk, Kherson, Mykolaiv, Zaporizhzhia and Dnipropetrovsk regions. The cities that suffered the most during the war include Mariupol, Kharkiv, Chernihiv, Sievierodonetsk, Lysychansk, Sumy, Rubizhne, Izium, Mykolaiv, and Bakhmut.

The extremely massive nature of damage and destruction, the continuation of active fights, the constant change of the front line, as well as the lack of physical access to a large number of settlements make it difficult to conduct a detailed, objective, comprehensive assessment of damage. Prior to the full-scale invasion, 43,300 sq. km of Ukrainian territories were occupied, which made 7% of Ukrainian territory. Currently, the uncontrolled area is 2.9 times larger and is more than 20% of the total area of Ukraine. However, the use of indirect valuation methods allows to make preliminary calculations on the total volume and structure of damages to physical assets (residential, non-residential buildings; infrastructure); losses of the economy by sector breakdown, as well as needs to rebuild the damaged assets.

This report presents such assessment of damages, losses (by sector breakdown) and preliminary assessment of the reconstruction and recovery needs (excluding additional needs for modernization, investment projects, etc.).

The date on which this estimate is valid is **June 13, 2022.**

The assessment is based on the methodology used by the World Bank and described in the Bank's key methodological documents[1][2][3], taking into account the limitations that exist in Ukraine, in particular the availability of datasets.

Damages assessment is updated on a regular (weekly) basis, based on the latest micro data on damages available. This allows to quickly adjust assumptions used in the assessment as the available and verified micro data is used as a proxy to assess the damage to other assets and/ or regions where such microdata is limited. Therefore, the assessment methodology provides a more accurate approach than purely indirect methods. In the meantime this led to a slight reduction of the damage value in categories of roads, airports, and housing **(Chart 2).**

---

[1] Jovel, Roberto J .; Mudahar, Mohinder. 2010. Damage, Loss, and Needs Assessment Guidance Notes: Volume 1. Design and Execution of a Damage, Loss, and Needs Assessment. World Bank, Washington, DC. https://openknowledge.worldbank.org/handle/10986/19047

[2] Jovel, Roberto J .; Mudahar, Mohinder. 2010. Damage, Loss, and Needs Assessment Guidance Notes: Volume 2. Conducting Damage and Loss Assessments after Disasters. World Bank, Washington, DC. https://openknowledge.worldbank.org/handle/10986/19046

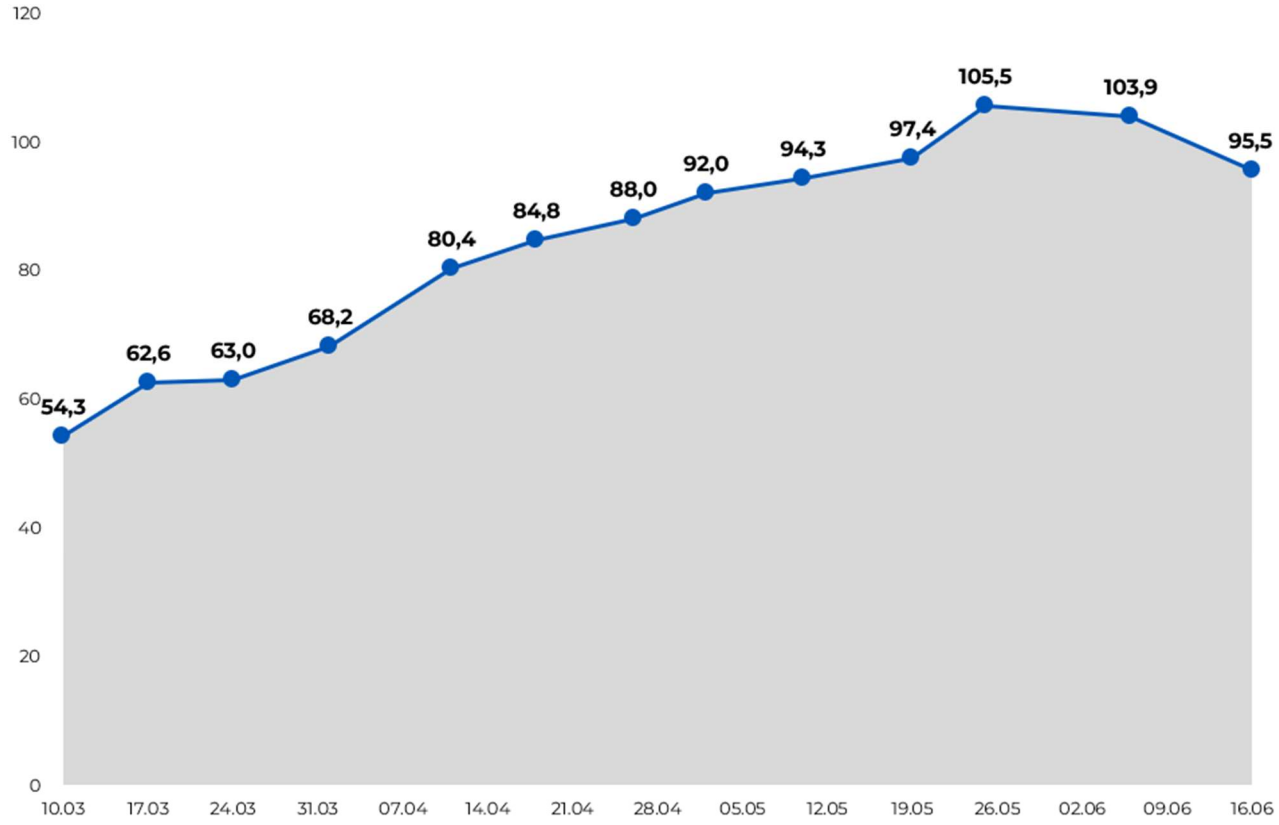
[3] Jovel, Roberto J.; Mudahar, Mohinder. 2010. Damage, Loss, and Needs Assessment Guidance Notes: Volume 3. Estimation of Post-Disaster Needs for Recovery and Reconstruction. World Bank, Washington, DC. https://openknowledge.worldbank.org/handle/10986/19045

Recovery needs assessments as well is subject to regular updates going further, taking into account the determination of sectoral recovery strategies; development of territorial development plans, etc.

The final assessment of the damages, losses and needs assessment is possible only after the war ends in Ukraine.

The report is based on a sectoral principle. At the end of the report there are summary tables with the relevant data for each sector/ industry.

Chart 2. Dynamics of the total damages assessment reflecting adjustments made on obtaining microdata for different sectors, $blns.



Source: Kyiv School of Economics

General principles of assessment methodology

The assessment is carried out by the Kyiv School of Economics, in partnership with the Ministry of Development of Communities and Territories of Ukraine, in coordination with the Ministry for Reintegration of the Temporarily Occupied Territories, and in cooperation with other central authorities, also taking into account information received from military-civilian administrations. The assessment is based on the World Bank's Damage, Loss, and Needs Assessment Guidance Notes, Volumes 1-3, and FAO[4] (Methodology For Damage And Loss Assessment). The assessment is carried out by an indirect method and in close collaboration with the World Bank team.

According to WB methodologies, the assessment of recovery needs includes three steps, which are carried out in sequence: (1) damages assessment to physical assets; (2) losses assessment; (3) assessment of reconstruction and recovery needs.

Key terms:

Damages – total or partial destruction of physical assets existing in the affected area;

Losses – a decrease in the number and value of flows (production, sales of goods and services, cash flows) caused by external factors; temporary changes in economic flows as a result of the war. Losses arise from the moment of invasion to the moment of achieving full economic recovery and reconstruction, which often lasts for many years. In the case of this assessment, this period is 18 months, starting in June 2022, as well as the first three months of the war (a total of 21 months). Losses are expressed in current monetary value.

The replacement cost is the cost of replacing the property with its equivalent at market prices prior to the war start (for the purposes of this report – in December 2021).

The recovery needs include the cost of repairing and replacing damaged assets based on the market price existing immediately after the end of the war, or in this case, the cost of replacement as of June 2022; the Build Back Better principle – that is, measures to improve functionality, energy efficiency, universal access, sustainability and the necessary upgrades. On top of that recovery needs can include part of losses, for example, for clearing debris, demining; additional costs of service providers associated with the restoration of basic services; and providing equitable and accessible services to vulnerable groups and affected population.

Damage assessment methodology:

Damage assessment is calculated in replacement cost; does not take into account objects in Ukrainian territories occupied after 24.02.2022, but considered undamaged.

For the calculation, micro data (where available) and assumptions (where unavailable) about the level of damage is used, according to three coefficients (no damage; damage up to 40%; damage above 40%, which according to the WB approaches is equal to the need for complete reconstruction/replacement of the object). 4 coefficients are applied to buildings (0% of damages; up to 10% of damages; up to 40% of damages; above 40%).

To clarify the assumptions about the level of damage, data from the analysis of satellite and aerial photographs of individual areas are used. High-precision images from drones collected by the Rebuildua project initiated by SmartFarming and Vkursi Zemli were used to calculate the damage to the infrastructure of cities, villages and settlements in Kyiv region (Moshchun, Horenka, Ozera,

[4] https://www.fao.org/3/ca6990en/CA6990EN.pdf

Pushcha-Vodytsia, Zabuchchia). Thanks to cooperation with the World Bank, access to Maxar's images has been gained, which will help clarify the degree of destruction in other cities of Ukraine in the coming months.

Data collection/ in-depth interviews with market participants/ enterprises are also conducted to improve understanding of the damage level.

Damage to large facilities (airports, large industrial enterprises, ships, aircraft, etc.) is assessed individually using financial statements. Individual coefficients of destruction can be used to estimate large infrastructure objects. The value of fixed assets as of the beginning of 2021 is taken for the identified enterprises. Medium-sized objects that can be counted (schools, hospitals, shops, cultural facilities, etc.) are valued at the average unit cost (estimated from financial statements, Prozorro tenders, etc.). Mass facilities (real estate, vehicles, small business assets) and networks (road and rail, electricity and gas distribution, telecommunications) are estimated via indirect methods, a combination of relevant regional statistics and the level of damages for individual regions or cities.

The assessment includes only losses from destruction/ ruining of buildings, not taking into account the cost of equipment. These estimates will be gradually added in the next stages of updating the indicator.

Losses assessment methodology:

This estimate is preliminary, and includes the main "side" effects of the loss suffered by different sectors as a result of the war, in particular: loss of potential income incurred by citizens, the state, businesses and additional expenditures of the state, business entities, citizens incurred as a result of the war. Such lost income and additional expenditures could be used by producers to finance their current activities (including the payment of wages, taxes, etc.), investment in working capital, or capital investment to expand production.

Losses are estimated in relation to our defined baseline scenario, which reflects the basic scenario of economic development without war. In determining the baseline scenario, we used data on production, consumption and trade for the 2021 calendar year (or the last reporting year for which official statistics are available).

To determine losses by project analysts use a regional approach, according to which differentiated loss coefficients were used (according to the duration and/or intensity of hostilities in the region, and, accordingly, the expected production losses). The losses assessment was carried out taking into account the industry specifics, which are described in more detail in the following sections of the report in the relevant areas.

The starting point for estimating losses is the period from the beginning of the war (February 2022) to the moment of full recovery of the economy and infrastructure, complete resolution of social and humanitarian challenges arising from the war. We anticipate that the resumption of such business chains and processes will take **more than 18 months, starting in June 2022. Thus, the total period for which indirect losses are calculated is 21 months (March 2022 - November 2023),** with certain exceptions for industries where the recovery of economic activity will take longer (e.g., horticulture, animal husbandry).

Reconstruction and recovery needs assessment methodology:

The needs for economic recovery reflect a mutually agreed vision of the recovery strategy of Ukraine as a whole and of each sector of the economy in particular as an important prerequisite

for the planning of the reconstruction process, which is designed to restore the country's economic capacity and solve the social and humanitarian challenges that arose as a result of the war. The assessment of Ukraine's recovery needs is based on estimates of damages and losses, described in the relevant sections.

This assessment **does not take into account the need to implement other modernization projects than related to the war time damages.**

According to international approaches, recovery needs are calculated as the aggregate need for financing the recovery of destroyed and damaged assets, which includes:

- the cost of restoring destroyed/damaged assets, taking into account the Build Back Better principle;
- multi-year inflation (for objects that will be reconstructed/built after 2022)
- the Government's vision of structural changes that should occur, for example:
    - changing the location for individual objects (and, accordingly, the costs of land acquisition; relocation of enterprises and employees);
    - a change in the demographic structure of the population, the movement of the population inside and outside the country, and accordingly - a change in the structure of citizens' demand for public services by region;
    - replacing outdated facilities/objects with fundamentally new, more economically justified and energy efficient ones;
- sequence and priority of recovery needs (building a timeline of recovery needs, taking into account real opportunities and priority in recovery)
- the additional need for liquidity for business entities to resume their activities (usually calculated as a ratio of the volume of annual losses);
- an additional need to strengthen the institutional capacity of the Government to support economic development/relaunch of economic entities, for example, the launch of additional electronic services; registers; creation of credit institutions, etc.

As part of this report, the preliminary recovery needs assessment was built on these principles and takes into account the following approaches.

(1) Reconstruction and Transformation. We took into account the needs for reconstruction and rebuilding of damaged infrastructure considering the Build Back Better principle and thus taking into account the additional need for:

- ensuring the energy efficiency of buildings, productions;
- building bomb shelters;
- technological modernization.

(2) Recovery. The restoration of economic activity will require, among other things, the restoration of liquidity of business entities and organizations (to the pre-war level), investments in lost working capital, restoration of personnel potential, accounting and management systems, etc. We estimate such a component of recovery needs as a function (share) of the lost income of such business entities as a result of the war. The assessment of needs has industry-specific features, which are described in more detail in the following sections of the report by relevant areas.

In the meantime, taking into account ongoing military conflict on the territory of Ukraine, within the framework of this report **the preliminary needs assessment was carried out with a number of limitations:**

(1) The assessment of Ukraine's recovery needs is carried out in current prices. Since we assume that the process of reconstruction of physical infrastructure objects will take at least 10 years, the assessment of reconstruction needs in future periods should be adjusted for the level of expected inflation.

In the meantime, as the war still goes on, the current needs assessment does not take into account long-term inflation and uses current prices as of June 2022. According to preliminary calculations of the Ministry of Development of Communities and Territories of Ukraine, the increase in prices for construction materials in June 2022 compared to December 2021 is about 27%. The recovery needs are assessed at the official $/ UAH exchange rate as of June 13, 2022.

Another significant factor is the availability and price fluctuations of construction materials, both on the Ukrainian and international markets.

(2) Current needs assessment does not take into account changes in the scope of service provision due to significant demographic changes in Ukraine; additional measures to strengthen the institutional capacity of authorities.

(3) Another limitation of the current assessment is that it does not count for the monetary value of damages and needs for the environmental recovery. The assessment of environmental damage was carried out by the team of the Ministry of Environmental Protection and Natural Resources, together with partners, according to its own methodology, and currently contains only certain/ fragmentary estimates of the financial costs of environmental damage caused to Ukraine as a result of hostilities.

(4) Current needs assessment does not take into account the general losses of the economy from the war (loss of GDP, investments, labor force, etc.).

SOCIAL SECTOR

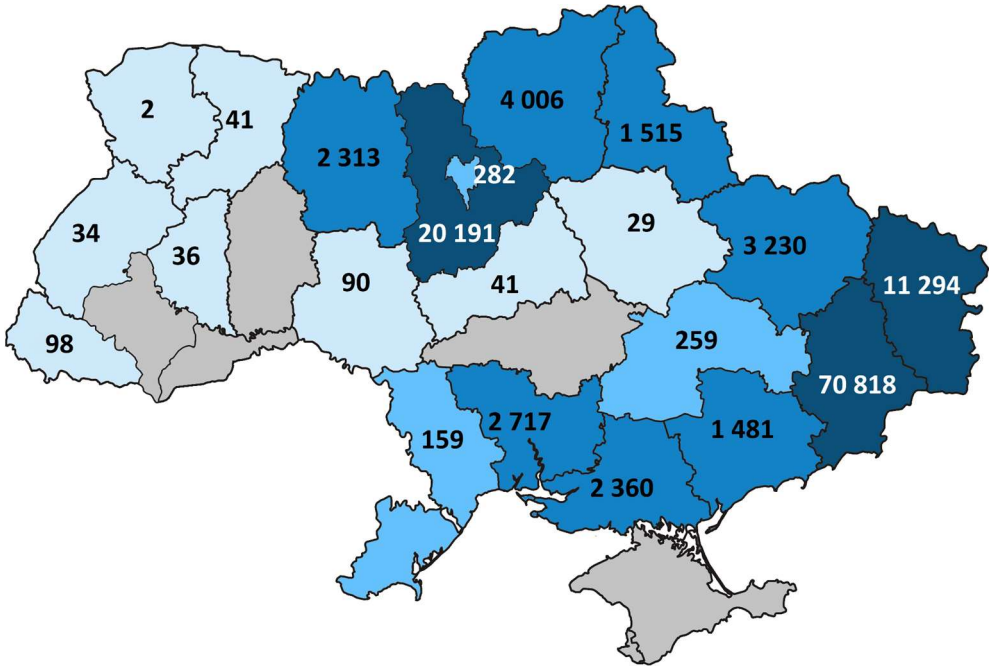
Housing and administrative buildings

Massive rocket and artillery shelling led to massive destruction of the housing stock in cities, especially those located near/on the front line. According to preliminary estimates, as of mid-June 2022, more than 50% of the housing stock was damaged or destroyed in 23 cities and towns as a result of hostilities in the Russian Federation. This creates a need not only for the reconstruction of individual buildings, but also for the comprehensive reconstruction of whole cities, the development of new urban planning documentation, etc.

The housing stock of cities such as Mariupol, Kharkiv, Chernihiv, Severodonetsk and Lysychansk suffered the greatest destruction. In some cities, it is as high as 90-95%. The number of damaged residential buildings is increasing due to the continuation of hostilities in Kharkiv, Luhansk, Donetsk, Zaporizhzhya, Kherson, and Mykolaiv regions.

The total number of destroyed or damaged housing stock is about **121 thousand buildings**, of which 107.8 thousand are private houses; 13.1 thousand are multi-apartment buildings; and also about 100 dormitories.

Map 1. Regional distribution of the number of destroyed or damaged objects of the housing stock



The total area of damaged or destroyed objects is 61.0 million square meters[5], which is 6% of the total housing stock of Ukraine. Of them, almost one third is completely destroyed.[6]

Thus, the housing of about 1 million households (about 2.6 million people) is damaged or destroyed.

[5] When calculating the total area of private and apartment buildings, the average area of buildings was used, which was calculated as the mean based on the analysis of object-by-object data on damage and destruction by regions and by types of buildings. In regions where there were no site-specific data, the value of the average building area of neighboring regions was chosen as the basis. These values may change as a result of detailed on-site technical inspections of buildings.

[6] The distribution of data on the damage level was based on the analysis of object-by-object data. In the regions where active hostilities are taking place (Donetsk, Zaporizhia, Luhansk, Kharkiv and Kherson) and there is no detailed information on the degree of destruction, it was assumed: that of the total number of objects 5% with a degree of destruction of the building up to 10%; 55% - with the degree of destruction of the building from 10% to 40%); 40% - with a degree of destruction of the building over 40%.

In moonetary terms, damage to the housing stock is $36.8bln.[7] This is the largest item among asset types. This is more than a third of the total amount of damages.

To restore housing to its previous state, the following should be done:

- new construction;
- capital repair or reconstruction of residential buildings;
- cosmetic repair of residential buildings;
- restoration of the adjacent territory near residential buildings (fences, benches, landscaping, children's and sports grounds, etc.);
- purchase of durable goods (furniture, household appliances, consumer electronics etc.).

In addition, 511 administrative buildings were destroyed, of which: 494 are buildings of state or local administration bodies; 17 are centers for the provision of administrative services. In monetary terms, damages for administrative buildings is $0.9bln.

The risk of shelling, the destruction of housing, and the loss of lives led to the need to evacuate more than 12 million citizens. 5.1 million of them left Ukraine; another 7.2 million citizens became internally displaced persons (ISPs). To support such citizens, the Government assists them in provision of temporary housing, including:

- compensation of expenses for owners of housing temporarily housing internally displaced persons who moved during the period of martial law ("Shelter" program, in accordance with the resolution of the CMU of March 19, 2022 No. 333). As of June 13, 2022, the government has allocated UAH 100 million by the end of 2022, such losses may increase to UAH 1.7bln ($60 million);
- compensation to local budgets for the payment of communal services provided during the placement of temporarily displaced persons during martial law in buildings (premises) institutions, enterprises, institutions and organizations of state and communal ownership, educational institutions of private ownership. By the end of 2022, such losses may increase to UAH 3.0bln ($100 million).

Additionally, losses include the costs of dismantling destroyed or damaged buildings and removal of construction materials amounting to **$2.5bln** (estimated at approximately $80 per sq. m. of a building). For administrative buildings the respective loss is 60 million.

The reconstruction of housing will require significant investments, since the new housing will be built considering the "build back better" principle, which involves compliance with modern standards regarding:

- security (availability of a bomb shelter, fire exits, etc.);
- energy efficiency (compliance with thermal insulation requirements);
- accessibility (availability of a ramp, elevator, etc.).

Finally, a major factor that would affect the cost of reconstruction will be a significant increase in the prices of construction materials, in particular cement, concrete, reinforcement, glass, etc.

According to preliminary estimates, the total cost of repairing and rebuilding damaged and destroyed housing would cost at least UAH 1,614bln ($55.2bln). For administrative buildings, this is UAH 36.7bln ($1.3bln). (See Appendix 1).

[7] When calculating direct losses, the values of the indirect cost of housing construction by regions of Ukraine as of January 1, 2022, approved by the order of the Ministry of Regional Development of February 17, 2022 №53, as well as other components of replacement cost calculated on the basis of market values and expert assumptions.

Health care

Documented damages of healthcare facilities amount to $1.5bln. In total, since the beginning of the war, at least 779 health care facilities have been damaged or destroyed.

The health care facilities whose damage is assessed as part of the project include hospitals, polyclinics, dentistry, consulting and diagnostic centers, medical offices, paramedics and midwives, dispensaries, rehabilitation and health centers, laboratory centers andblnood centers, outbuildings of health care facilities health. Losses from destruction caused to private medical facilities are calculated separately.

Data on the destruction of healthcare facilities was obtained from the Ministry of Health (for public facilities), microdata (for private facilities) and from open sources.

Information on the number and cost of beds, area of the objects, the cost of square meter and cost of similar objects in the Prozorro public procurement system, as well as data from open sources on the degree of damage to objects is used to calculate losses.

Damages to healthcare facilities account for about 1.3% of the total cost of losses in Ukraine. Dispensaries (268) and hospitals (227) are the most destroyed or damaged types of facilities, while hospitals accounted for more than 34% of the cost of all damages in the industry. As of June 13, at least 24 private medical facilities were damaged. However, the documented losses include primarily state institutions.

The next step is also the detailing of other sectoral losses — institutions of medical education, forensic medical examination and others.

Losses to the industry are more than double than the damages. The total losses are estimated at $2.7bln. The absolute majority of this amount — $2.7bln — are losses of private health care facilities revenues due to business interruption, damages, security threats, occupation, as well as due to the decline in consumer spending due to population displacement and decline in disposable income. The rest of the losses are due to the reduction of budget expenditures under individual programs.

In order to assess the loss of revenues of private health care institutions due to the suspension of activities and the decline of consumer demand, statistical data on revenues under section 86 "Health Care" of the Classifier of Economic Activities was taken.

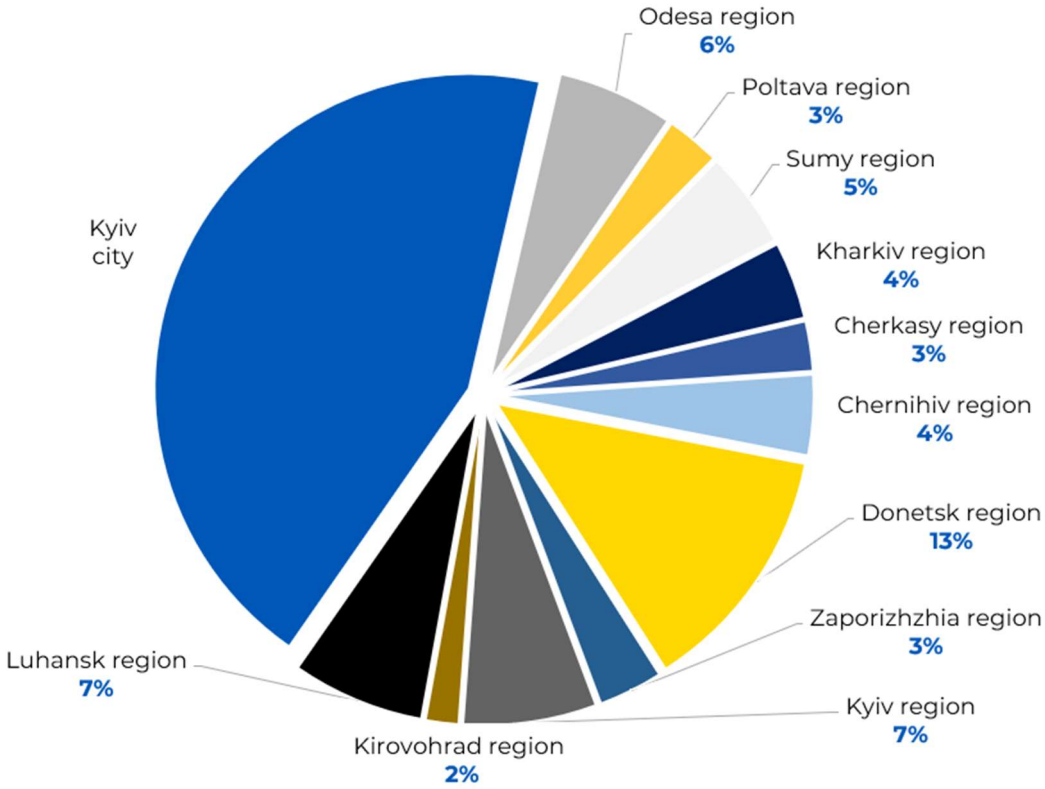
The data on revenues under this section was weighted by coefficients set arbitrarily for regions taking into account information about the degree of damage to the physical infrastructure of the region, the duration and intensity of hostilities, the duration and current status of the occupied/de-occupied territory and the share of residents who moved out and into the region (according to the data of the mobile operator).

Also, taking into account that statistical data on the revenues of companies by type of economic activity is available for 2020 only, an adjustment by the growth of nominal GDP in hryvnia for 2021 was introduced. Given that the statistical data and budget expenditure reductions refer to a calendar year, the data was extrapolated for the assessment period of 21 months from the beginning of the russian invasion.

The assessment of losses of the industry resulting from the reduction of budget spending due to change in spending priorities during martial law was made based on data on budget programs in Resolutions of the CMU dated March 10, 2022 No. 245 and dated April 19, 2022 No. 465.

The key factor for the losses of the economy are decreased revenues of the medical facilities. In addition to the direct impact of hostilities, a significant factor is the decline in consumer demand due to the temporary displacement of the population, the regional distribution of losses is also impacted by the scale of the industry in the region.

Chart 3. Regional distribution of private medical institutions losses



The total recovery needs are about UAH 68.4bln or $2.3bln. Of these, almost UAH 62bln is the cost of rebuilding destroyed and damaged facilities.

The needs consist of an assessed cost of rebuilding the health care infrastructure, taking into account modern requirements for energy conservation and security requirements (installation of bomb shelters), as well as working capital recovery of state, communal and private health care institutions.

Recovery needs were calculated as follows:

The cost of restoring healthcare facilities and other buildings (administrative, dormitories, etc.) is calculated based on the damage assessment, taking into account the "build back better" principle, which involves compliance with modern safety standards (a bomb shelter, fire exits, etc., correction factor 1.125) and energy efficiency (compliance with requirements for thermal insulation, correction factor 1.1).

Also, the cost of restoring destroyed and damaged medical facilities is significant due to the need to use modern medical technologies and standards (Appendix 2).

Educational institutions and objects of scientific infrastructure

One of the biggest victims in terms of the number of destroyed, damaged and lost infrastructure objects are science and education. In total, more than 2,000 educational facilities were damaged as a result of the war. Additionally, the war interrupted the educational process, and the state was forced to reduce budget expenditures in this field to direct part of the "educational" funds to more urgent needs of the state (primarily defense, addressing the consequences of damages and increased need for social protection).

Documented damages from the destruction of educational institutions amount to $3.5bln. In total, as a result of hostilities, at least 196 educational and objects were destroyed and 1865 objects of educational infrastructure and at least 90 scientific were damaged.

The educational institutions whose damages are assessed as part of the project include preschool (kindergartens), secondary (schools), vocational, extra-curricular, pre-higher (colleges and

technical schools), higher (institutes, universities, academies) and specialized education institutions.

The main damages in the field of education concern secondary, pre-higher and technical schools, due to their prevalence and attractiveness to be used during hostilities by the aggressor's manpower. Despite active fighting took place in 11 regions, educational institutions were damaged in 18 regions. There are no losses from the damages and destruction of educational institutions in the Volyn, Zakarpattia, Ivano-Frankivsk, Poltava, Ternopil, and Chernivtsi regions.

The largest number of destroyed educational institutions was recorded in Donetsk, Kharkiv, Luhansk and Kyiv regions. Among the damaged and/or destroyed educational facilities, the largest number belongs to schools and kindergartens.

The total losses of the education sector are estimated at $2.1bln, of which almost $1.6bln are the reduction in expenditures of the general budget fund under educational and scientific programs, and $485 million of losses are attributable to private educational institutions' revenues due to the suspension of operations due to damages, security threats, occupation, as well as due to a decline in consumer demand due to population displacement and a decline in disposable income.

Calculations of losses were made on the basis of the following assumptions:

In order to assess the losses of private educational institutions due to the suspension of activities and the decline of consumer demand, statistical data on the revenues under section 85 "Education" of the Classifier of Economic Activities was taken.

The data on revenues under this section was weighted by coefficients set arbitrarily for regions taking into account information about the degree of damage to the physical infrastructure of the region, the duration and intensity of hostilities, the duration and current status of the occupied/de-occupied territory and the share of residents who moved out and into the region (according to the data of the mobile operator).

Also, taking into account that statistical data on the revenues of companies by type of economic activity is available for 2020 only, an adjustment by the growth of nominal GDP in hryvnia for 2021 was introduced. Given that the statistical data and budget expenditure reductions refer to a calendar year, the data was extrapolated for the assessment period of 21 months from the beginning of the russian invasion.

The assessment of losses of the industry resulting from the reduction of budget spending due to change in spending priorities during martial law was made based on data on budget programs in Resolutions of the CMU dated March 10, 2022 No. 245 and dated April 19, 2022 No. 465.

The main source of losses is a sharp reduction in budget spending due to the need to finance the defense forces, and due to the actual suspension of the educational process, depending on the type of education and region.

Unlike, for example, the healthacare, the revenues of private educational institutions are not that significant, hence the losses due to the suspension of activities and the decline in consumer demand were moderate.

Also an important factor is the long cycle of educational services, which reduced the decline in demand due to hostilities and will lead to faster recovery on controlled territories, which will be limited only by the outflow of consumers of educational services across the border.

The preliminary estimate of the total recovery needs is $4.4bln, of which more than $4bln is the cost of rebuilding destroyed and damaged facilities.

The recovery cost educational facilities and other buildings (administrative, dormitories, etc.) was calculated based on the damage assessment, taking into account the "build back better" principle, which involves compliance with modern safety standards (a bomb shelter, fire exits, etc., correction factor 1.125) and energy efficiency (compliance with requirements for thermal insulation, correction factor 1.1).

At the same time, a key uncertainty that complicates the assessment of recovery needs is the lack of planning for additional needs in educational capacities across regions, taking into account the continuation of changing trends in the movement of citizens within Ukraine and abroad.

Objects of scientific infrastructure

At the time of preparation of this report, there is only limited data on damages to scientific infrastructure facilities, as well as losses of Ukrainian science.

According to preliminary calculations, 117 objects of movable and immovable property of 34 institutes and other institutions of the National Academy of Sciences of Ukraine were destroyed, damaged and seized for the needs of the Armed Forces of Ukraine. The preliminary total estimate of losses ofscientific institutions of the National Academy of Sciences only amounts to UAH 214 million.

In addition to damages, the science suffered losses, in particular due to the reduction of budget expenditures under the relevant budget programs for 2022. Among them, planned expenses for ensuring the activities of the National Research Fund, grants for scientific research and scientific and technical developments were reduced (this reduction is included in the total losses of education and science). Among other factors, essential components of indirect losses of Ukrainian science, for which quantitative data is currently being collected, are:

1) suspension or cancellation of funding of scientific research and institutions under the international scientific cooperation programs;

2) losses of scientific institutions and higher educational institutions as a result of the state granting benefits to tenants of state property, which was introduced by Decree of the CMU No.634 of May 27, 2022 "On the specifics of renting state and communal property during martial law". According to this decree, for the period of martial law and for three months after it ends, the rent is charged at the rate of 50% of the amount of rent established by the lease agreement (taking into account its indexation), and in some territories, tenants are generally exempted from rent for a certain period. In particular, in the territories of Kyiv, Chernihiv, Sumy, Kharkiv, Zaporizhzhia, Mykolaiv regions and the city of Kyiv for the period of martial law (but not longer than September 30, 2022). As a result, only institutions of the National Academy of Sciences, as expected, will lose rent in the amount of UAH 130-140 million.

The recovery and modernization of Ukrainian science is crucial for the recovery of Ukrainian economy and will require prioritization of funding in favor of areas and institutions capable of producing significant scientific results, including long-term, in fundamental research. Such a prioritization can be carried out through the National Research Fund, which during its activities since 2018 managed to gain and demonstrate a certain institutional capacity and credibility (Appendix 4).

Social services

Due to large-scale hostilities in various regions of Ukraine, social facilities, including social protection institutions, geriatric institutions, sanatoriums, children's camps and orphanages, and boarding schools, were damaged.

Damages of social networks amount to $0.2bln. This includes the destruction and damage of social infrastructure facilities under the Ministry of Social Policy. The largest share of damages belongs to social protection and geriatric institutions; in particular in Kyiv, Donetsk, Luhansk, Mykolaiv, Sumy, Zaporizhzhia and Chernihiv regions.

Losses and a preliminary needs for reconstruction significantly outweigh due to unprecedented increase in potential recipients of social services due to military aggression and thus the significant additional social expenditures that the Government is forced to make to support a considerable number of victims of hostilities (internally displaced persons; children who have lost their breadwinners; persons with disabilities, etc.).

The minimum amount of funds needed for social support (under the budget programs of the Ministry of Social Policy) is **$6.4bln**. (Based on the number of additional recipients of social assistance, which arose due to the war as of June 1, 2022).

The total losses needs are at least $6.6bln.

Significant housing losses for family-type orphanages can significantly reduce the pace of implementation of the state care reform for orphans and children deprived of parental care.

If the recovery does not take place in full, the number of people who will need social services will significantly outweigh the number of people who will be able to receive them. It will negatively affect the quality of human capital and reduce the adaptive capacity of the population in the face of prolonged military confrontation, deteriorating economic situation and prolonged recovery (Annex 3, Annex 6).

Culture, sport and tourism

The cultural sphere is a special part of the national identity and therefore the restoration of damaged cultural institutions and objects will play an important role in rebuilding the country in the postwar period.

Due to the high intensity of hostilities in eastern and southern Ukraine, as well as regular rocket fire throughout its territory, most cultural, sports, and religious institutions have ceased operations or significantly reduced them. As a result, 12.5 million residents of at least 6 regions of the country (Donetsk, Zaporizhzhia, Luhansk, Mykolaiv, Kharkiv, and Kherson regions) have lost access to cultural services, and other 13 million people from 7 regions have limited access to them.

Unprecedented increase in security risks and cancellation of civilian flights directly affects the tourist attractiveness of the country, which is currently close to zero. The mining of the coastal zone leads to a full stop for domestic seaside tourism.

As of June 13, damage to culture, sport and tourism is minimum $0.7bln or UAH 21.9bln.

According to micro data, at least 527 cultural facilities, 36 religious buildings, 49 tourism and 95 sports facilities have been damaged or destroyed. In particular, 32 churches/temples, 4 monasteries, 253 houses of culture, 31 sports schools, 36 museums, and 49 tourist facilities, which are mainly located in 14 regions, have been damaged.

Important cultural and religious sites were damaged, including the Holy Dormition Svyatogorsk Lavra, the Donetsk Academic Regional Drama Theater (Mariupol), the National Literary Memorial Museum of Hryhoriy Skovoroda, and many others. In addition, some art collections were lost, including a collection of Scythian gold discovered by archaeologists in the 1950s, which was probably removed by the occupation authorities from the Melitopol Museum of Local Lore.

This assessment is based on the site-by-site list of damaged/destroyed sites provided by witnesses and local administrations, which creates the risk of incomplete data on the list of damaged objects.

An important methodological limitation of this assessment is that the financial value of the objects is calculated without actual cost of their cultural value due to the difficulties in its remote calculation as well as the absence of a single and integral register of cultural buildings, which would contain detailed data on cultural heritage, art objects. Given this limitation, damages to libraries and museum collections, costs for relocation of museum funds, etc are not included into the damages assessment at the current stage. Projects of restoration, conservation, museification of cultural heritage sites are developed individually for each site, taking into account a set of survey data and world best practices, which requires the involvement of international experts. The valuation of such projects takes time and is based primarily on the results of a comprehensive survey and careful documentation.

Another limitation is difficulty with costing the interior decoration of religious and other cultural institutions, art objects, decorations, exhibits, icons, frescoes, etc.. Accordingly, the damages

value will increase at a later stages when the price of their restoration will be additionally calculated.

Damages to cultural and tourist facilities leads to substantial loss of cultural and tourist sectors. **The total losses of culture, sport and tourism are at least $ 4.3bln.** According to experts, about 50 thousand people have lost or may lose their jobs in culture and tourism due to the closure of institutions. The migration of professional communities is also an important factor for losses.

Tourism is badly affected by the war Ukraine. Ukraine has lost its foreign tourists that amounted to 4 million people in 2020. Due to active hostilities, threats of missile strikes, and land mining 13 out of 24 regions faced a full of partial stop of the tourism activities.

The total recovery needs for tourism, sport and culture amount at least to $ 1.6bln. (Annex 5).

A significant factor for recovery is demining of cultural and touristic sites as well as substantial increase in prices for construction materials. The minimum area for demining of the seashore is about 20 thousand sq. km. Until complete demining of most coastal tourist areas, which can take several years, tourism will suffer major losses in the affected regions.

Another factor is a need in relocation of movable cultural objects (e.g. museum collections), part of which have already been transported to safer places.

PRODUCTIVE SECTOR

Industry and business services

The total damage to the assets of enterprises is estimated at $8bln. In total, at least **388** enterprises have been damaged or destroyed since the beginning of the war. Probably, the actial figure is higher, because not all companies have information, especially when it comes to the temporarily occupied territories.

Enterprises can be divided into two groups. The first are destroyed accidentally or as a collateral damage during the shelling of military units and settlements. The second are destroyed deliberately, as part of targeted strategic missile strikes. In addition to the transport and energy infrastructure facilities described in the relevant departments, these are primarily military and dual-production use facilities. Unlike the first group, which is concentrated in the frontline regions, the second is evenly distributed throughout Ukraine.

Damages include:

- Damage to property, plant and equipment (initial valuation is taken because it is not possible to acquire an asset at its book value in most cases);
- Damage to unfinished capital investments;
- Damage to inventories of finished goods and intermediate materials (we assume that in most cases the stocks were located near the main production facilities).

Depending on the availability of data, losses are calculated in one of the following ways:

- For private enterprises for which the owner has reported her own estimate of losses, after verification, the following estimate is used;
- For the enterprises of the state sector the estimations provided by the ministries and agencies whom respective enterprises report to.
- For large and medium-sized private enterprises, for which the level of damage is known, the financial statements are taken as of the last available date. We distinguish between destruction (100%) and partial damage (40%).
- For small private enterprises, an indirect calculation basiyв of an expert assessment of the level of damage in the most affected settlements was done.

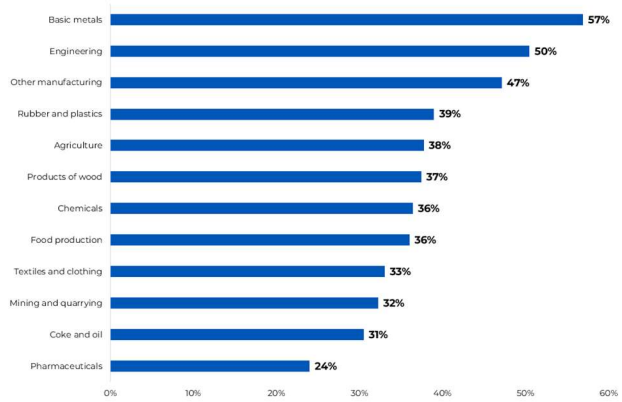
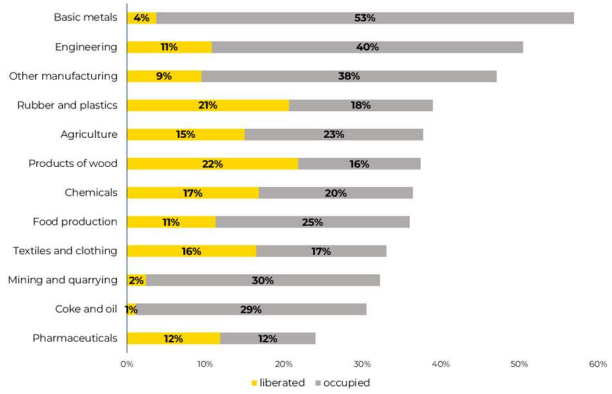
The main conclusions about the losses of enterprises are as follows:

1. Enterprise assets are the third largest item of damages. It accounts for about 10% of the total losses.
2. In terms of industries, metallurgy suffered the most. In particular, two enterprises were destroyed, which are the largest in the list of damaged / destroyed - Azovstal and MMK. Ilyich (both - Mariupol).
3. In terms of regions, the Donetsk region suffered the most, accounting for almost half of the total direct losses of enterprises. Also significant losses in Kharkiv, Luhansk and Kyiv regions (Annex 7).

The total losses of enterprises are estimated at $28.7bln. Similar to danages, the actual figure is likely to be higher, as the impact on value chains will still need to be investigated in detail.

Currently the economy is recovering from the initial shock. People are returning to their homes from abroad and from other regions, and businesses are gradually resuming work. As of June 3 (100th day of the invasion), according to a survey among members of the European Business Association (EBA), 50% of companies returned to normal operation, while in early May there were only 28%. Therefore, not all indirect long-term effects have manifested themselves.

In total, nine front-line regions accounted for 30% of Ukraine's GDP in 2020. Excluding the three liberated areas in the North, this figure is 21%. And the share is even higher if you look at exports (33% and 26% respectively) or individual industries.

Chart 4. The share of regions in GDP, 2020	Chart 5. The share of affected areas in industrial and agricultural production, 2020.
	

Source: Ukrstat, CES calculations

Indirect losses incurred by owners of industrial enterprises include loss of income. We use the following assumptions:

- Destroyed and damaged enterprises are considered as noe operating, unless proven otherwise (for damaged);
- Enterprises in certain sectors of the economy have stopped or significantly reduced their activities, regardless of physical injuries, due to a significant drop in demand (advertising, employment, exhibitions, rental of cars and recreational goods, etc.);
- As only historical financial statements are available, we assume that hryvnia revenues would grow in proportion to the consumer price index.

The total need for business recovery is estimated at $16.8bln, of which 65% goes to the reconstruction of physical assets, 35% goes for the recovery of activities.

Asset **reconstruction needs** are calculated based on the amount of direct losses indexed to rising construction prices and the need to meet modern requirements for human safety, emissions and energy efficiency...

Activity **recovery needs** means the need to replenish working capital, which is calculated on the basis of indirect losses multiplied by the coefficient (Annex 8)

Commerce

The total damages to the retail are estimated at **$2.1bln**. During the fighting, 2,903 retail outlets with a total area of 1.6 million square meters were severely damaged. It is difficult to calculate the final number of damaged objects at this time due to the continuation of active hostilities in Kharkiv, Luhansk, Donetsk, Zaporizhzhia, Kherson, Mykolaiv regions and the temporary occupation of some territories.

The following establishments and objects were included in the objects of the branch:

- Warehouses (excluding wholesale warehouses),
- Pharmacies,
- Shops.

Information on the destruction of these facilities was obtained from members of the Association of Retailers of Ukraine and the Ukrainian Council of Shopping Centers, the professional community, and from open sources.

Damage assessment was performed according to the expert method of standardized interviews and online surveys of owners and top managers of retail companies, taking into account the area and nature of damage to the building, based on the cost of construction and repair work, equipment and inventory. The survey involved 295 leading network companies that represent about 1,000 brands and have 28.5 thousand outlets with a total area of 15.4 million square meters.

The calculation includes: the cost of restoration of buildings owned by companies, the cost of repairs, utilities, the cost of store equipment and inventory, the cost of warehouses owned by companies, warehouse inventories, and vehicle fleet.

This does not include enterprises with less than three outlets, merchants in the street markets, warehouses of wholesalers and manufacturers, stores that have suffered only minor damages.

The indirect losses of retail are estimated at $22.6bln. All this amount falls on the reduction of retail trade due to emigration, falling purchasing power of the population and the destruction of stores.

The sector needs $3.9bln to reconstruct. Working capital needs were not calculated separately, as they consist in the purchase of goods, while destroyed stocks of goods are already included in the assessment of direct losses.

Damages and losses of **shopping centers**, which are not participants of the retail market themselves, but provide space for such participants, are calculated separately. **Damages to shopping centers amounted to $347 million.**

Shopping center status is granted to commercial real estate objects that are considered shopping centers according to the ICSC European classification of shopping centers. According to this classification, a shopping center is an architectural structure with a lease area of more than 5,000 square meters, which has a professional management company and at least 10 tenants. In total, there are 329 shopping centers in Ukraine, another 19 new ones were to open in 2022.

Estimation of damage was done by an expert method taking into account the area and nature of the damage based on the construction cost of $ 800-1100 per m2, depending on the type. The calculation does not include losses of tenants (equipment and goods), they are taken into account in the previous section.

The total losses incurred by the shopping center industry are estimated at $1.7bln. Losses are calculated by determining the cash flow of domestic shopping malls based on the potential they would have in 2022, given the increase of 15% compared to 2021. This growth was observed in January 2022 and also corresponds to the growth rate of retail trade in Ukraine in early 2022.

The largest losses to the shopping center is attributed to eastern Ukraine, where hostilities continue. Despite the fact that some shopping centers resume operation, income remains at 30% of pre-war levels. On the contrary, the Center and the West show a rapid recovery in April and May. Gradually, from May and June, the North, Kyiv and the South begin to recover, too.

The key factors for estimating losses for retail are the reduction in consumption due to migration and hostilities. The industry is also affected by the difficulties that retailers have now in Ukraine such as logistics, foreign exchange transactions, staffing problems, lack of financing, higher prices due to the depreciation of the hryvnia, and massive damages due to destruction.

The total need to reconstruct the industry is estimated at $347 million. All this amount falls on the reconstruction of shopping centers. Unlike most other areas in this report, the loss on the recovery of physical assets was taken without an increasing factor, as modern shopping centers

are already being built taking into account modern conditions for security, energy efficiency, accessibility, etc. (Annex 9).

Agriculture and farmland resources

The amount of damages to the land fund and agro-industrial complex of Ukraine is $4.3bln.

Assessment of damages in Ukrainian agriculture includes the following main components: damaged farmland; agricultural machinery; elevators and other storage facilities; damages in livestock and beekeeping; damage to perennial crops; damaged and stolen inputs and loss of harvested grain and oilseeds products.

The damages are estimated by an indirect method, using relevant state and regional statistics.

Damage to farmlands includes the costs of land recultivation after the explosions; costs of demining the minefields and unexploded ordnance; the replacement and repair cost of irrigation infrastructure; and damage caused by farmers' inability to harvest winter crops due to occupation or mining pollution.

The estimated amount of damages to owners (land users) of agricultural land, taking into account the actual costs incurred to bring the farmland to a usable condition, is determined in accordance with the Procedure for determining and compensating landowners and land users, approved by the resoluton of Cabinet of Ministers №284 dated 19.04.1993.

The largest portion of damages is caused by the inability to harvest winter crops, resulting in an estimated more than $1.43bln in damages. The second-largest category of damages is destroyed agricultural machinery. The estimated cost of repairing and replacing damaged equipment exceeds $926 million.

About 19% of all irrigated agricultural lands in Ukraine are located in the temporarily occupied Kherson region, and another 10% are in the partially occupied Zaporizhia region. The estimated cost of replacing and repairing damaged irrigation infrastructure is $225 million.

The cost of surveying the lands in areas with a high risk of mining pollution and demining the affected areas is estimated at $436 million.

The total losses of Ukrainian agriculture are estimated at $23.35bln, $11.93bln of which are losses caused by the navalblnockade that caused logistics disruptions and, on average, 33.7% lower domestic prices for key agricultural export-oriented commodities. A decrease in crop production caused losses estimated at $9.85bln. A decrease in livestock production and beekeeping resulted in an estimated $706 million in losses for farmers, and another $859 million in losses were caused by rising prices for key inputs.

We estimated five major sources of losses in Ukrainian agriculture as a result of the Russian invasion. In our analysis, we estimated losses caused by:

- lower crop production (annual crops)
- lower livestock and beekeeping production
- lower perennial crops production
- the navalblnockade and consequent decrease in domestic prices for key export-oriented commodities
- higher cost of production because of an increase in input prices

For the production of the annual crops, we estimated an expected decrease in the upcoming harvest by considering two key components - a decrease in the sowing area (by region) and reduced yields. The expected sowing area reduction coefficients are region-specific and depend on the extent of the hostilities taken (taking) place in the area and whether a portion of the region was (or still is) under the occupation.

The same region-specific coefficients were used to estimate the losses for the livestock and beekeeping sectors. For these sectors, on the other hand, we do not assume a decrease in productivity, and while losses for the beekeeping, similarly to losses in annual crops production,

were estimated for only one year - for the livestock sector, the losses were estimated for two years of lower production. For perennial crops, the losses are estimated at five years of lower yields, as the estimated average time needed for newly planted gardens to start bearing fruits is five years.

To estimate the losses caused by the navalblnockade, we calculated the difference between farm-gate prices before the Russian invasion and post-invasion prices for the main export crops - wheat, sunflower, corn, and barley. The expected volume of these crops' production for 2022 (without Russian invasion) was used to determine the combined losses because of the supply chain disruption caused by the navalblnockade.

To estimate losses due to higher key input prices - fertilizers and fuel - we estimated the expected consumption of these inputs, adjusted for the decrease in the sowing area. The expected consumption estimates were multiplied by the post-invasion price changes for these inputs.

Key sources of losses in Ukrainian agriculture due to the russian federation's invasion:

- Decrease in the annual crop production. Factors that affected the crop production - reduction in sowing areas due to occupation, active hostilities, and mining pollution, as well as - an expected decline in yields because of logistical disruptions in the supply of factors of production (fuel, fertilizers, seeds, and spare parts for agricultural machinery).
- Decrease in farmers' revenues due to the navalblnockade of sea traffic by the russian navy. The maritimeblnockade severely limits Ukrainian export capabilities leading to a surplus of export-oriented commodities on the domestic market and collapsing domestic prices for key agricultural commodities.

The biggest source of losses caused by the russian invasion is a decrease in domestic prices for export-oriented commodities, resulting in more than $11.93bln in losses.

1. The weighted average reduction in domestic prices for the main export-oriented agricultural commodities reaches 34%.
2. The estimated drop in the sowing area is about 21%.

The total estimated reconstruction and recovery needs are $17.52bln.

There are four categories of reconstruction and recovery needs:

1. Reconstruction needs - compensation for the damages.
2. Support for the production recovery - compensating a fraction of the losses in the amount required to restore production.
3. Restoring agricultural financing - liquidity support to banks for agricultural financing.
4. Supporting public institutions for service delivery.

In compensating for damages, the principle of “build back better” is applied. Thus, following this principle, the compensations for damaged storage facilities, apiaries, perennials, dead livestock, and bees are 20% higher than the replacement cost of these assets. All other categories of damages are compensated without additional coefficients.

The share of losses caused by the lower production should be compensated so that farmers who have not been able to begin their production cycle due to hostilities, occupation, or mining pollution have the resources to restart their production. This compensation is estimated as a share of revenues corresponding to the cost of production. A provision for compensating for the war-induced increase in input prices is set to 50% of the losses caused by the increase in input prices.

There is also a need to compensate for 10% of losses incurred due to lower domestic prices for export-oriented agricultural commodities. Given the 25% average profitability of crop production and a 34% decrease in domestic prices after the Russian invasion - a 10% compensation of losses will allow farmers to continue their operations and avoid bankruptcy.

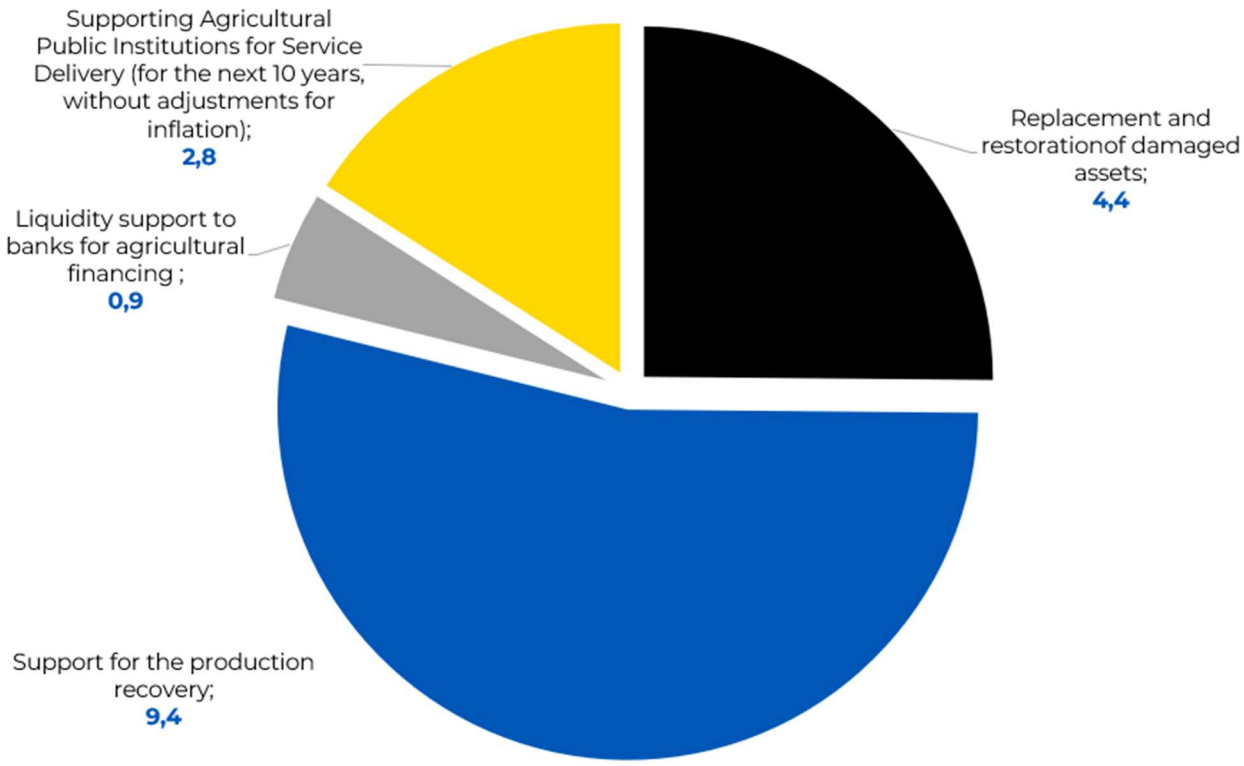
The estimated need for additional liquidity in the banking system for a sustainable renewal of financing in agriculture is 30% lending volume to farmers as of January 1, 2022 (according to the National Bank of Ukraine's statistics). The funding of public institutions needed to facilitate the

industry's recovery includes the continuation of current funding with an additional 20% of the budget required to cover the growing administrative workload caused by the Russian aggression.

The main conclusions on the recovery needs:

1) The overall reconstruction and recovery needs are substantially higher than the damages the agricultural sector faced. The most significant component of needs is the partial compensation of losses caused by the decreased production, accounting for $ 9.4bln, or almost 54% of all needs. This compensation is required so that farmers who have not been able to begin their production cycle due to hostilities, occupation, or mining pollution have the resources to restart their production.
2) The time needed for a full recovery of agricultural production and reaching the pre-invasion 2021 level of production depends on the pace of farmlands inspection for mining pollution, unexploded ordnance, and clearing of these hazards.
3) There is a need to develop and strengthen the public infrastructure for the administration of payments and post-war assistance to farmers and communities (including spatial planning). The need to maintain this infrastructure will remain long after the end of active hostilities.
4) The production cycles in agriculture imply a high risk of facing the cash flow gaps. Farmers need working capital to procure inputs and to sow and fertilize crops. The revenue from selling their products appears only at the end of the production cycle, after the harvest. Under these circumstances, the availability of financing instruments is essential for the effective functioning of the industry. Therefore, resuming agricultural financing is vital, which requires additional liquidity for the banking system. The reason is that in short to medium term, the financial institutions would not be able to provide the financing in the volume needed for the industry's recovery. In addition to measures aimed at risk mitigation for lenders (such as the further development of the Partial Credit Guarantee Fund), the sector needs intervention to refinance non-performing loans and finance the working capital for agricultural producers. The need for additional liquidity is estimated at $ 912 million (Annex 10).

Chart 6. Needs for restoration of agro-industrial complex and land resources by articles, $bln



Source: KSE calculations

INFRASTRUCTURE

Transportation infrastructure

Infrastructure facilities were one of the key areas that came under most attack by the aggressor with the deployment of a full-scale war against Ukraine. In particular, in the first weeks of the war, Russian forces carried out massive shelling of aviation infrastructure, primarily airfields not only for military, but also civilian and military-civilian (dual-use) purposes. Subsequently, railway infrastructure, including electrical substations, became the targets of active attacks.

But the greatest destruction of infrastructure, both in absolute terms and in terms of value, was to road infrastructure. Firstly, given that they naturally become targets of shelling during artillery attacks, and secondly, because it is Russian tanks that are actively moving along Ukrainian roads during the entire period of military aggression. In particular, lines of communication between Russian forces in Ukraine and their rear areas in Russia and Belarus are often run by the roads.

Since the war started, 19 airports and civilian airfields, at least 57 railway stations have been damaged. Total damages amount to $31.3bln, losses are $17.7bln. Preliminary reconstruction needs are estimated at $41.8bln.

Road maintenance

A detailed analysis of the condition of damaged roads could be implemented only within a specialized technical survey, which is not possible until active fighting is still going on on a significant part of the territory of Ukraine.

However, comparison of the map of combat operations with the infrastructure network allows to make preliminary calculations as to what approximate length of roads has been damaged, both as a result of rocket fire and tank movements. According to the study ‘Damaging effect of moving tank loads on flexible pavement’, Journal of Engineering, 2010, the destructive effect of a tank can be as much as 2.36 times the destructive effect of a standard axle load from civilian vehicles.

This study took T-72 tanks, which is a good approximation in the case of war in Ukraine, since most tanks are similar in physical characteristics or even heavier. The surface layer of the roads suffers severe damage due to the metal tracks. The destructive effect of tank braking is 2.38 times more than the destructive effect of tank mass on road stretching. Finally, the destructive effect of tank maneuvers is 1.22 times greater than the effect of the destructive effect of the tank mass on the stretching of the road. What is important - the stress effect from the tank is not only horizontal, but also vertical, and the maximum stress, according to the research, is at a depth of up to 3 meters, which affects the degree of destruction of not only the surface layer of the road.

The average cost of damage of one kilometer of road in the city is usually significantly higher (the difference can be by a third or more) compared to the cost of roads outside the city, due to the road construction in cities, which includes communication networks, sidewalks, lighting, etc.

About 23.8 thousand km of roads and 305 bridges and bridge crossings are damaged. According to the Ministry of Infrastructure, a preliminary review of road conditions in the de-occupied regions (Chernihiv, Kyiv, Sumy, Kharkiv regions) confirm preliminary estimates of significant damage to road structure as a result of the passage of tanks and other heavy military equipment, which will require reconstruction of a large part of the damaged roads. Damaged are approximately 40% of roads occupied by Russian troops or where fighting takes place.

According to Ukravtodor, the average weighted cost of reconstruction of roads in 2021 (taking into account different categories of roads) was approximately 29 million UAH per 1 km of road. Thus preliminary estimates of the total damaged roads is $25.4bln.

Additionally the military aggression has led to significant losses in the road construction industry due to the cancellation of state capital investment in the planned roads building since the beginning of a war. Losses are estimated at $5bln.

An important factor for the road reconstruction will be the disruption of supply chains; a decrease in the domestic supply of materials needed for reconstruction; a significant increase in competition for materials given the nationwide reconstruction needs; and risks of devaluation of the national currency.

According to preliminary estimates, the total reconstruction and recovery needs for roads is estimated at $31.2bln. Given the significant amount of damages caused to roads means that reconstruction will take at least 3-5 years.

Railroad Infrastructure

With the outbreak of war, the Ukrainian railroad took the brunt of the free of charge evacuation of millions of Ukrainian citizens (as well as a large number of businesses) caught up in the war zone; as well as the delivery of critical supplies and equipment to those regions. In response, the Ukrainian railroad has become an active target of Russian shelling and attacks.

The total damaged railroad bed is up to 200 km; the number of damaged railway stations and stations is at least 57. As of June 13, about 1200 km of railroad tracks are located in the temporarily occupied (after 24.02.) territory. There is reason to believe that all movable property of “Ukrzaliznytsia” (UZ), which was not removed from such territories in time, can be considered as completely lost (destroyed or stolen by the troops of the aggressor country).

Thus, the total damages of the railroad as of June 13 are estimated at $3.1bln. Losses of the railway infrastructure (without private players) are estimated at least at $4.4bln, primarily due to the shortfall in income from transportation, the cost of (re)evacuation of the population, transporting humanitarian aid, payment of financial aid to the families of the dead, wounded employees, as well as other services provided for the defense of the country.

Given the difficult financial situation in "Ukrzaliznytsia" prior to the war, this means further deterioration of its financial metrics, which means much higher recovery needs.

The total railroads reconstruction and recovery needs is preliminary estimated at $5.3bln. Apart from the reconstruction one of the key needs is investment in the expansion of the railroad export capacity to the EU in order to partially compensate for the loss of export goods (and hence UZ income from freight transportation) through blocked seaports. This estimate does not generally take into account the need for modernization, due to the high degree of depreciation of fixed assets (rolling stock, in particular).

Aviation industry

The aviation industry began to suffer losses from the military aggression even before it had actually started. On February 12, global insurance companies informed Ukrainian carriers that they had stopped insuring aircraft due to the high threat of invasion by Russia. This led to the risk of cancellation of flights of international air carriers to Ukraine. To counter this a working meeting with the leadership of the Office of the President of Ukraine, the State Aviation Service, SE "Ukraerorukh", SE IA "Borispol" and Ukrainian airlines was held and the government expressed its willingness to support air carriers by providing additional financial guarantees to the aviation market.

With the outbreak of the war, the airspace over Ukraine was immediately closed and air traffic ceased. Russian forces began active rocket attacks on all key airfields in Ukraine in an attempt to deprive it of its ability to provide air defense. As a consequence, 19 airfields were damaged out of 35, including 12 civilian and 7 dual-purpose airfields (not including military airfields). Some of the airfields were hit several times each.

Detailed information about the state of damage/capacity to repair airfields at most airports can be made only after detailed technical surveys. However, according to preliminary calculations, **the damage to the aviation industry (airports, airfields, aviation equipment) is about $2.04 bln.**

A comparable amount is also indirect losses of the industry from military operations, as since the war started the work of the entire civil aviation industry has actually been stopped; revenue from passenger traffic has ceased completely.

Losses of the aviation industry are estimated at $5.3bln, of which $0.46bln are losses of the airports, $4.28bln are losses of the airlines, $0.25bln - of the state air traffic service enterprise (Ukraerorukh), $0.29bln - of other subjects of commercial activity on airports.

Chart 7. Losses of Ukrainian airports, $bln

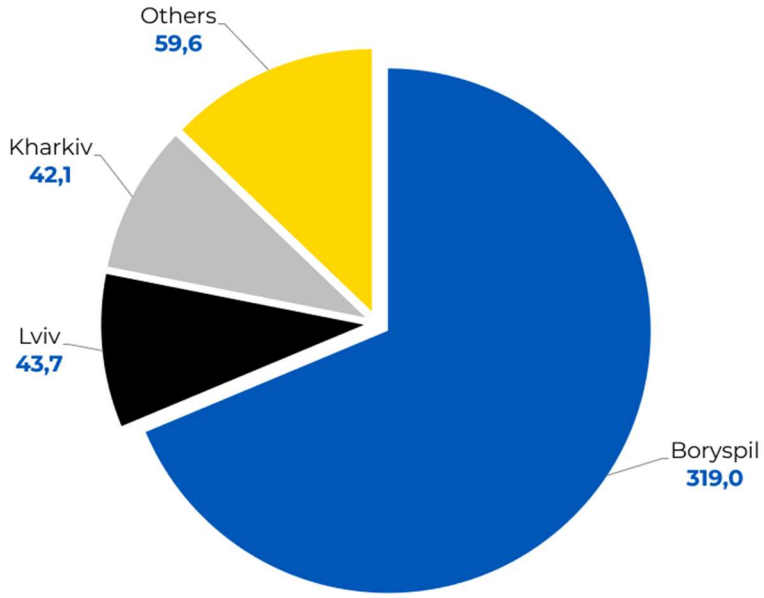


Chart 8. Losses of Ukrainian handlings companies, $bln

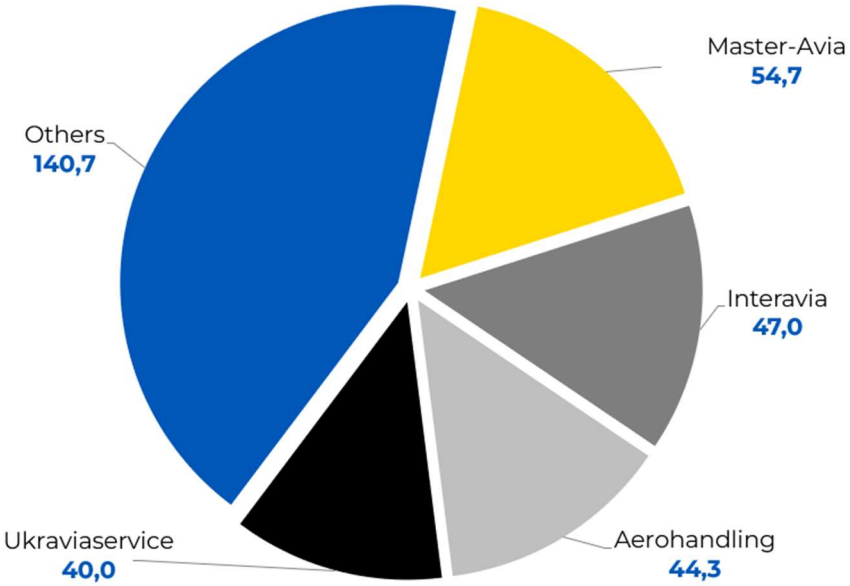
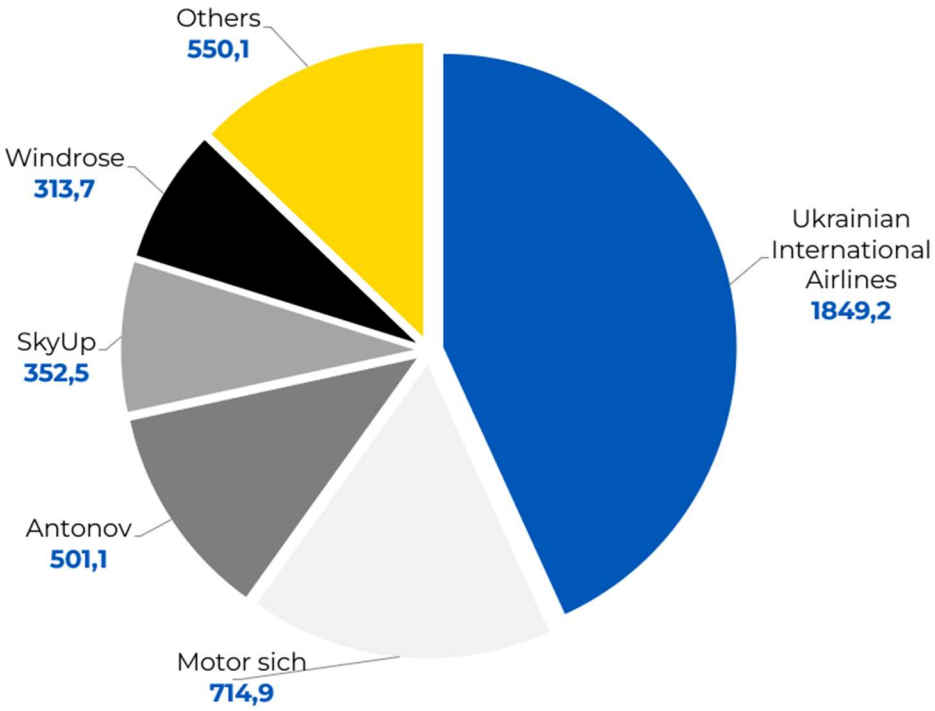


Chart 8. Losses of Ukrainian airlines, $bln



Source: Calculations of the Kyiv School of Economics

The reconstruction of the aviation sector can be conventionally divided into several stages according to the priority of measures for the quick launch of the industry.

The total estimate of priority (short to medium term) needs is $3.0 bln, including $1,41bln to reconstruct in first 5 post war years 5-7 airports that would meet modern standards of ICAO and adapted to receive new types of aircraft (including a family of A320/NEO and B737NG/MAX).

At the next stages of reconstruction, as demand for air transportation will grow, it will be necessary to restore/construct about 5 more airports in new locations to provide sufficient capacity of the airport industry of Ukraine.

Water transport

The total damage to water transport infrastructure is estimated at **$471 million**. This estimate includes both seaport infrastructure and inland water transport facilities destroyed during the war.

At least four ports have had property destroyed or damaged since the war began. For example, the grain terminal at the Nikolaev port of Nika Terra was destroyed.

The moderate destruction of ports is due to two factors. Firstly, the port is quite a complex and spacious facility, consisting of many large parts. So it is impossible to completely destroy such an object with a few precise missile strikes. Second, the aggressor seized or used its own and friendly cargo ships in order to export grain, ferrous metals, etc., for which it needed operating ports.

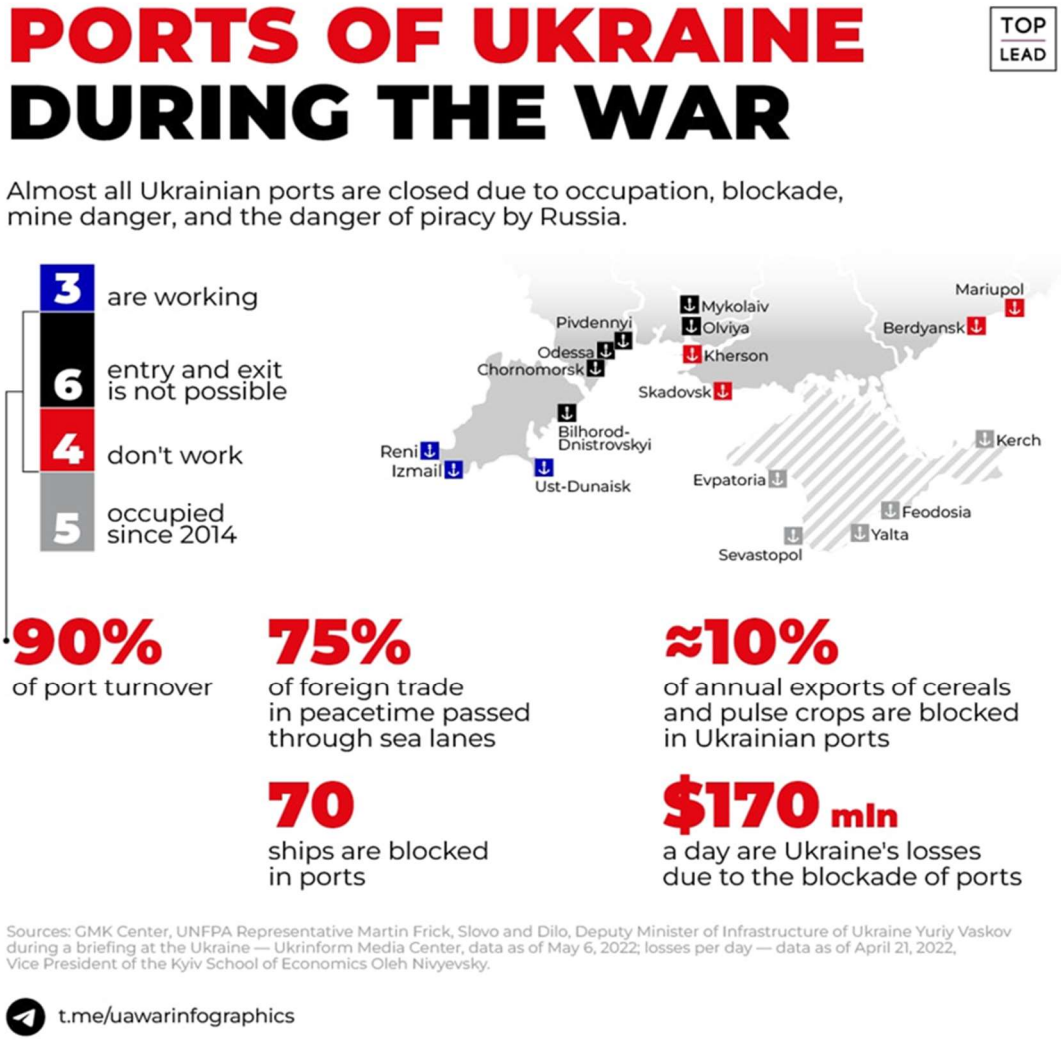
For example, the Metinvest group reported the enemy's plans to remove 200,000 tons of metal products worth $170 million from the Mariupol plants. In turn, regarding grain, it was reported that 400-500 thousand tons (worth hundreds of millions of dollars) were stolen from the four occupied southern regions, which is more than a third of the local reserves. It is expected that the aggressor will try to sell these stocks through partners in the Middle East, particularly through Syria. (Clarification: stolen stockpiles of goods are not included in the above figure, they are accounted for in the losses of the relevant industries).

Despite moderate damage to the physical infrastructure, losses of the water transport industry are enormous. The total losses of of sea ports and inland water transport is estimated at **$2.7bln**. The aggressor controls Sea water area with the help of the fleet, missile installations in the Crimea and sea mines. Maritime trade traffic is completely stopped.

The ports of Mariupol, Berdyansk, Skadovsk and Kherson are occupied. The ports of Nikolaev, Odesa and other cities are shut down. There is no traffic on the Dnipro due to the blockage of the lower part of the river. Only the ports on the Danube River work, their turnover increased fourfold compared to the pre-war period.

The total need for the reconstruction of the enterprises of water transport is estimated at **$1.021bln**. This amount is roughly evenly divided between the restoration of damaged infrastructure and the funding needs to keep the industry running again.

Map 2. Status of Ukrainian ports



Postal operators

Total damages to postal operators are estimated at **$11 million**. The amount is calculated based on data from Ukrposhta and Nova Poshta, which account for the lion's share of the market. A total of several hundred post offices, dozens of terminals/depots and vehicles, as well as a large number of parcels, for which the operators are financially responsible, have been destroyed or damaged since the beginning of the war.

Total indirect market losses are estimated at **$266 million**. The lion's share of this amount is due to lost revenue. Market players also made additional payments to employees and their families, and also financed evacuations and personnel relocation.

The total recovery needs estimate is **$18 million**. All of this amount is needed to rebuild and repair fixed assets (Appendix 12).

Vehicles

In the territories and towns where heavy fighting took place, both public and private vehicles were severely damaged. The direct damage to both municipal and private carriers is $0.9bln, which is replacement cost for destroyed trolleybuses, streetcars, and buses. Damages to private cars amount to $1bln/ 105 thousand vehicles. 623 firefighting vehicles worth $ 30 million were lost, excluding other specialized equipment, as well as trucks (to be calculated at the later stages). Damages to private cars are calculated based on available data on the officially registered number of cars and does not take into account cars not registered in Ukraine and imported without customs clearance.

Damages to municipal transport vehicles are calculated using both indirect methods and micro data available on damaged/destroyed municipal property provided by military administrations.

The greatest damage to municipal property, which includes municipal (public) transportation, was inflicted in Luhansk and Donetsk regions, as well as in Kharkiv.

Losses of passenger carriers (except “Ukrzaliznytsia”) amount to approximately UAH 5.9bln or almost $200 million. If in Kyiv, Chernihiv and Sumy regions after de-occupation there is partial resumption of passenger transport work, in some regions as of mid-June, provision of such services was not renewed due to intensive combat operations or occupation - Luhansk, Donetsk, partially Kharkiv, Zaporizhzhia and Mykolaiv regions.

The vehicles damaged include the destroyed “Mriya” aircraft, with the reconstruction value, according to “Ukroboronprom”, is more than $0.5 bln. Although damages to air passenger transport are likely to be higher due to possible destruction of other civilian/cargo aircraft during shelling of Ukrainian airportss; however, in the absence of detailed information on the location of such aircraft at civilian airfields, such assessment will be carried out at later stages.

At least $4.5 bln is needed for rebuild destroyed vehicles, of which biggest shares are the bus fleet and private vehicles (Annex 11).

Digital infrastructure

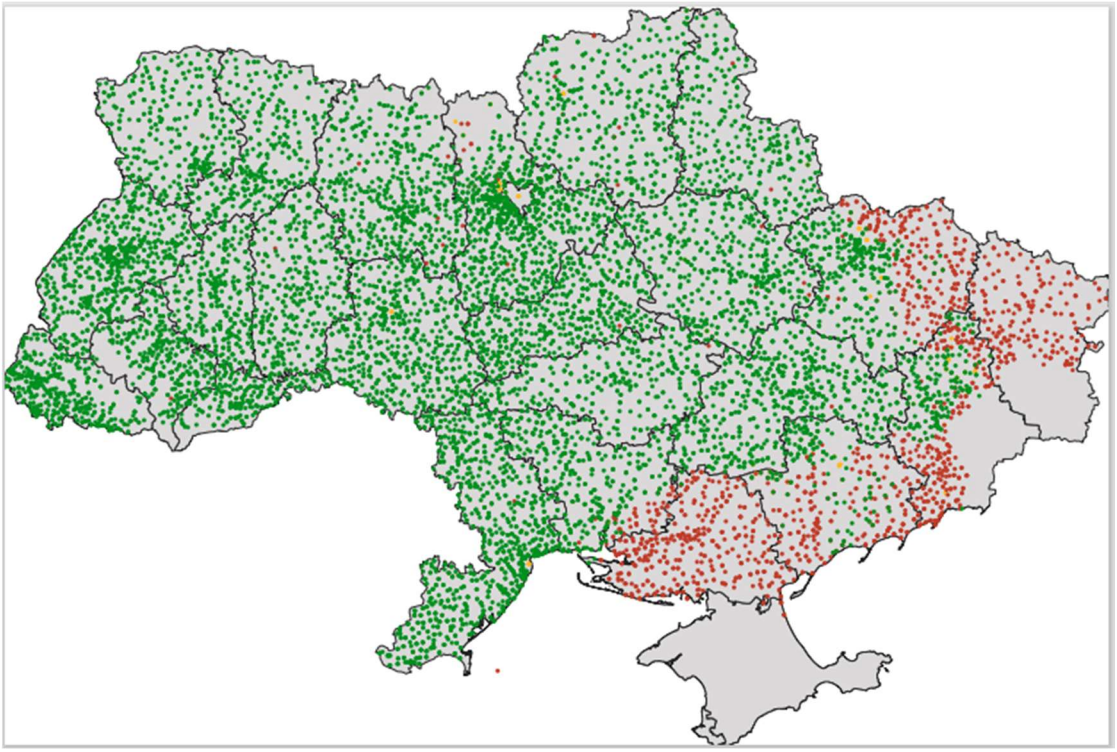
The total damages to telecom operators are estimated at **$566 million**. The sector of electronic communications includes:

- Internet networks of fixed-line operators;
- Radio networks of mobile operators;
- Backbone/core networks;
- Technical and related means of electronic communication.

At least 726 fixed-line electronic communication operators have suffered damages as a result of hostilities. After the de-occupation of settlements, the destruction of networks reaches 100%. Across the country, the quality of data transmission over fixed-line Internet access networks decreased by an average of 13% (estimated as of May 01, 2022).

In 12.2% of settlements there is no access to mobile communication; in 3.1% it is partially accessible. 3,534 base stations of mobile operators do not work, which is almost 11% of their total number. Over the last month, the total number of non-operating base stations increased by 700. Across the country, the quality of data transmission over mobile Internet access networks decreased by an average of 26% (estimated as of May 01, 2022).

Map 3. Breakdown of non-operating mobile base stations



Determining the cost of losses to owners of electronic communications network infrastructure or its components (including the objects under construction) of various categories differs. The following classification is used:

- National companies, electronic communications operators that provide electronic communication services to citizens of Ukraine throughout its territory;
- Medium-sized companies that provide electronic communication services in several regions;
- Small companies that provide electronic communication services within the region.

For national companies, damages are calculated based on the results of inspections to the destroyed or damaged objects of electronic communications network infrastructure, if they are accessible (even, if possible, in the temporally occupied territories). The amount of damage is set in physical units (km, pieces, etc.), and it is also calculated in money terms based on an approximate estimate of the cost of restoration works.

For medium-sized and small companies, damages are calculated based on the estimated cost of restoration/reconstruction of networks or based on the average subscription fee for 24 months.

The total losses of telecom operators are estimated at **$1.097bln**. This is due to a 22% reduction in service delivery and respective payments.

The need to reconstrust the assets and recover the activities of telecom operators are estimated at **$1.012bln** (Annex 13).

Energy

As of June 13, damage to Ukrainian energy infrastructure is estimated at $1.8bln.

Both direct and indirect methods of calculating the value of destroyed and damaged facilities were used to assess damages in the energy sector. The cost of rehabilitating energy facilities was estimated, as either the initial book value, the cost of current repairs, or the replacement cost.

Basic information is obtained from open sources and from business owners involved in this sector. Some of the larger energy assets (like CHP plants) were estimated individually.

Damages to electric powr plants were assessed based on the cost of kW of installed capacity. Damages to power transmission and distribution companies were assessed using the area of damage (share of the region affected by the active military hostilities).

The assessment of losses in the energy sector is at its "initial stage" due to the lack of accurate data on privately owned facilities, no access to facilities located in the war zone and in the temporarily occupied territories of Ukraine.

According to the Ministry of Energy, distribution system operators suffered losses amounting to about UAH 15.4bln. But this amount is highly likely to increase significantly after assessing losses in the areas with ongoing hostilities and after taking into account the amounts of better repairs. Currently, all distribution system operators have carried out the smallest possible repairs, which allowed to quickly restore power supplies, but the reliability has deteriorated significantly.

About 4% of the generating capacities were destroyed during hostilities; 35% of the capacities is in the occupied territories. The loss of occupied assets is not taken into account when calculating direct damages to the infrastructure, but it affects the amount of indirect losses, including lost revenue.

The transmission system operator *Ukrenergo* estimates its losses at UAH 7.7bln without taking into account the assets located on the occupied territories. Gas distribution system operators suffered losses amounting to about UAH 6.1bln. 3 combined heat and power plants (CHPs) were completely destroyed; 5 CHPs were damaged. In general, about 50% of heat generation has been destroyed or is located in the occupied territories.

Zaporizhzhia Nuclear Power Plant, the largest in Europe, is located in the occupied territories with limited access to its proper maintenance. Despite the fact that it operates in the Ukraine's energy system, it is under constant pressure from the Russian occupiers. Furthermore, Zaporizhzhia Thermal Power Plant and Luhansk TPP are located in the occupied territories; fierce hostilities are around Vuhlehirska TPP.

Kakhovka Hydroelectric Power Plant remains occupied. Ukrhydroenergo estimates previous losses due to equipment damages at UAH 550 million.

About 30% of solar generation and more than 90% of wind generation are located in the occupied territories of Kherson, Zaporizhzhia and Mykolaiv regions. According to preliminary estimates, assets at the amount of about UAH 870 million were destroyed.

Since the beginning of the war the total indirect losses in the electric power sector are estimated at UAH 340.3bln. In the sector of gas production, transit and distribution, losses reach UAH 61bln. Losses account for UAH 64.6bln in the oil production and refining sector.

The methodology for calculating indirect losses in the electric power sector is based on the electricity consumption and production forecast before and after the start of the hostilities. Indirect losses are calculated for different groups of producers taking into account changes in tariffs and production. For regulated businesses like electricity transmission and distribution the indirect losses were calculated using the lost transmission/distribution volumes and average distribution

tariff for distribution companies and dispathcing and transmission tariff for the transmission system operator Ukrenergo.

The balance of production, consumption and imports is calculated for the sector of gas production, transit and distribution. Losses of пфы зкщвгсешщт companies are calculated based on the reduced production volumes. Gas production decreased by 10-12% during the full-scale invasion. For the gas transmission system operator, losses are calculated as reduction of revenues due to lower gas transmission for domestic consumption, revenues from the reduced fee for the entrance into to the GTS due to the reduction in imports imports, and losses of gas for technological needs (due to the leaks from the damaged pipelines, etc.). For a gas distribution company, losses due to reduced distribution volumes and gas losses due to technological needs are taken into account.

For the refining sector, losses of Ukrainian refineries from production shutdowns are taken into account. No oil refinery is operating now (own production provided about 30% of oil products); there are logistical difficulties with the supply of oil products.

Main conclusions about indirect energy losses:

1. In the electric power sector, major losses (70%) are incurred in the generation sector. The main factor of losses in the electric power sector is the reduction in electricity consumption volumes. As a result of hostilities, there is a significant decline in demand (35% drop compared to 2021), which, in turn, is due to a significant decline in industrial production (especially metallurgy), reduced volumes of freight transportation by electric trains, and a general decline in economic activity. In addition, the electricity consumption profile has changed significantly due to the relocation of consumers to the western regions.

2. In the gas segment, the largest losses are due to decreased production in the damaged wells or the wells that ceased production due to military hostilities. The main factors of the indirect losses are the decline in gas consumption and production volumes. Ukrainian production companies lose up to $1,000 for every 1,000 m3 of gas which is not produced. Production volumes tend to decrease due to naturall decline and lower CAPEX in new drilling and workovers. Industrial consumption has fallen by ca. 50% thus forcing domestic gas products to inject gas into the underground gas storages due to the reduction in demand.

3. In the oil refining segment, the main indirect losses were incurred due to the shutdown of production at the Kremenchuk refinery and Shebelinsky gas refinery.

A significant increase in energy and fuel prices makes it difficult to meet demand and/or prepare for the autumn-winter period.

Energy prices and tariffs for heat and energy transportation remain unchanged for a large proportion of consumers, which increases financial imbalances in the energy system. Thus, as of June 1, 2022, the expected deficit of funds in the electricity market is about UAH 35bln.

At present, the assessment of needs in the electric power and gas supply sectors is extremely difficult due to the fact that it is necessary to build a new forecast balance of energy consumption in order to calculate the needs. The country's energy balance is the basis to determine the necessary generating capacities, structure of the transmission and distribution networks. Ukrainian power system uses outdated power generation technologies which significantly limits the system's ability to increase the share of energy from renewable sources and thus we believe that the sector's needs should account for additional provisions to improve the energy system's flexibility.

If we use a simplified calculation procedure based on losses and liquidity needs to resume operational activity, without future energy balance taken into account, **the total needs of the**

sectors account for about UAH 103bln. In order to take into account the needs of the industry in technological modernization and to calculate the needs of the power system in the recovery, the cost of physical losses of assets was adjusted by a 1.4x multiplier; it was also suggested that in order to resume operations, the financial support should be provided in the form of working capital injection, amounting to about 10% of the lost annual revenue.

The estimate of the energy sector losses can be further adjusted to account for: 1) a decrease in the level of payments for electricity and services in the electricity market as a result of fierce hostilities in some territories; 2) lost revenues and other losses of the energy sector participants related to the decisions of the Energy Ministry, sector regulator or other government bodies as a result of the war (like limiting payemnts to renewable power producers, etc. see Annex 14).

Utilities

The infrastructure of utilities, which is an important part of the life support systems of settlements, has become one of the targets of Russia's missile and artillery strikes. Constant shelling and hostilities made it impossible or significantly difficult to carry out repair works, which led to the disconnection of heat and water supply systems. In some cities, residents do not receive utility services and have no adequate access to drinking water.

For example, because of the damaged water supply system the majority of districts of Mykolaiv have no centralized water supply since April 12. It cannot be repaired because of constant attacks made by the Russian Federation. As of June 13, 2022, only technical water is available in the city, while drinking water is still being delivered from other cities.

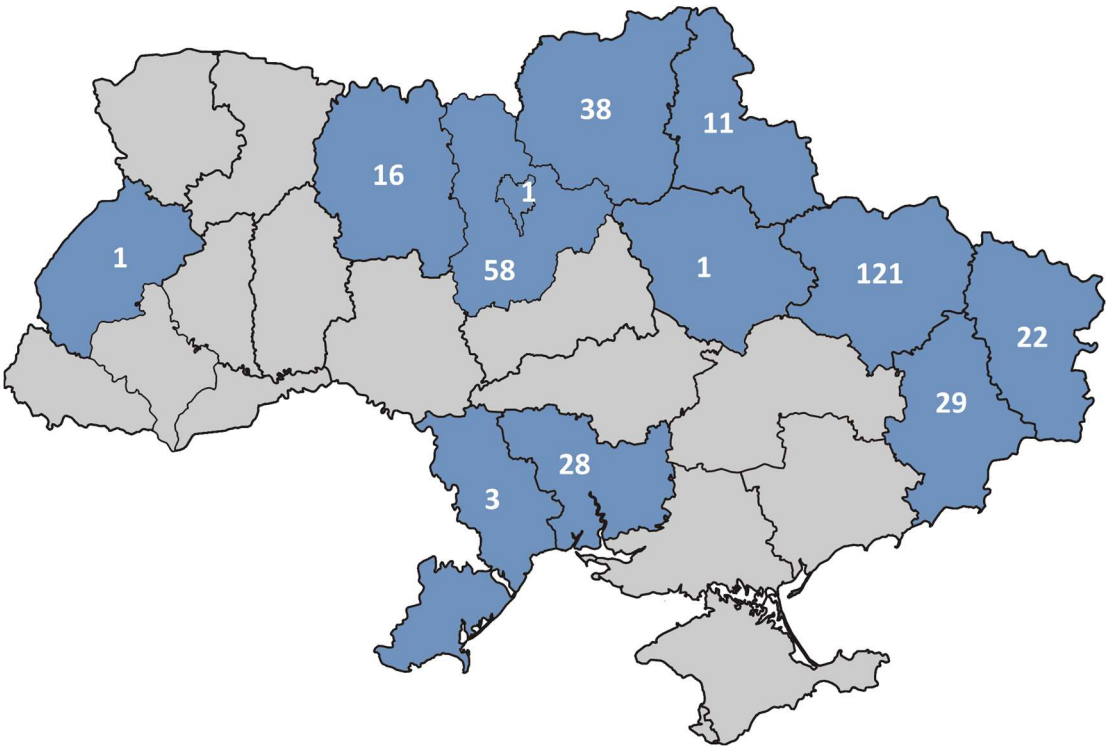
The situation with life support systems in Donetsk and Luhansk regions remains difficult. In Severodonetsk, where fierce hostilities are currently taking place, it is impossible to repair the boiler/heating facilities of the municipal enterprise Severodonetskteplokomunenergo, which provides heat supply for 180 apartment buildings. The operation of Severodonetsk CHP (combined heat and power plant) has also been suspended. Moreover, there is no water supply in the cities of Rubizhne and Popasna.

Damages to heat supply facilities (excluding CHP), water supply and sewage, and household waste management facilities is estimated at $1.3bln.

According to preliminary estimates, during the full-scale invasion phase, in the territories with current active hostilities, three thermal power plants were completely destroyed and five more were damaged. For example, the destroyed Kremenchuk CHP (Poltava region) covered about 70% of the city's needs, which is about 180 thousand residents of the community, who may be left without heat and hot water for the next heating season. Cakculation of damages caused by the destruction or damage of CHP is presented in the section "Energy".

In addition, 329 boiler/heating facilities were partially damaged or completely destroyed. Most of them are in Kharkiv, Kyiv, Chernihiv and Mykolaiv regions. 99 centralized heating stations were partially damaged or completely destroyed. About 222 running kilometres of heating networks were completely destroyed.

Map 4. Regional distribution of the number of destroyed or damaged boiler/heating facilities



About 816 running km of water supply networks were destroyed; 10 water treatment facilities were partially damaged or completely destroyed. Furthermore, 38 water pumping stations were also destroyed/damaged. Laboratories that analysed the state of water supply in the region were also destroyed or damaged. Preliminary estimates indicate that five such facilities were destroyed/damaged.

About 242 running km of sewerage networks were destroyed; 51 sewage pumping stations were partially damaged or completely destroyed, most of which are located in Kyiv, Kharkiv and Chernihiv regions (9, each). 14 sewage treatment plants are also considered destroyed/damaged.

As a result of the Russian invasion to Ukraine, 13 landfills for household waste were destroyed/damaged. Also, three waste sorting lines and three biogas facilities were completely destroyed. Vehicles for waste removal were also destroyed, in particular, 172 garbage trucks were ruined.

Total losses related to the objects of heat and water supply, and water disposal are estimated at $2.3bln. These are losses of service providers due to the reduction of payments for services.

The total needs for heat supply facilities (excluding CHP), water supply and sewage, and household waste management facilities are estimated at $1.6bln (Annex 16).

FINANCIAL SECTOR

A full-scale war causes a wide range of operational risk events for banks: disruption of processes, damage and destruction of assets, system failures, etc.

From the first day of the war, banks had to reduce the activities of their branches in the areas where there was a threat to safety of the staff. According to the Financial Stability Report of June 2022, published by the National Bank, in early March only 21% of systemically important bank branches operated in or near the war zone, and 60% – in Ukraine as a whole. As of mid-June, 85% of bank branches are already operating in Ukraine due to the de-occupation of the northern regions.

Hundreds of branches, objects of investment property and other bank assets remain in the war-torn area. At the beginning of May, the residual value of banks' real estate in these territories exceeded UAH 700 million. Banks have already recorded **UAH 154 million** in damages incl. UAH 33 million in the occupied areas or areas that are suffering from hostilities. Financial institutions do not have any information on the destruction or loss of the rest of the property due to limited access, so they do not write it off so far. However, the risks of potential loss of these objects are extremely high. It will be possible to finally estimate the losses only after the end of the war.

One more category of losses is cash stored by banks in the areas where hostilities have taken place or which have been occupied. As of begining of May, the volume of banknotes lost due to robberies or seizures of branches amounted to UAH 470 million, which is only 0.6% of all cash in the banks on the eve of the invasion. Another UAH 60 million of banknotes were destroyed by banks or taken away for further exchange in the NBU.

From the beginning of the full-scale war to May, banks reduced their staff by 3%. About 11% of employees were on unpaid leave or facing downtime. These changes are partly due to a decrease in the number of working branches. Some of the employees went abroad or were drafted to the Armed Forces. At the same time, banks' staff costs increased. On the first days of the war, financial institutions paid their employees in advance, financed the evacuation and the creation of new jobs for the internally displaced personnel. Some banks have even raised wages.

Banks have successfully met the first challenges of the war: they continue operating and providing services where it is possible. The system of electronic payments and transfers works smoothly. This maintains customer confidence in financial institutions and reduces liquidity risks. However, losses incurred by banks will negatively affect their profitability and capital. Losses may increase due to the long-term effect of the implementation of certain operational risks.

According to the National Bank, as of the beginning of May, 51 banks reported losses caused by the war from the implementation of operational risks. The total amount of these losses is about **UAH 6.6bln**, which is more than three times higher than the damage caused by hostilities and crisis of 2014-2015 and more than ten times higher than the losses incurred during the first year of the COVID-19 pandemic. At the same time, the actual volume of losses may be even higher due to ongoing hostilities and the long-term negative effect of operational risk events.

However, the calculations of total damages and losses caused by the war reflect only direct physical losses, as the losses of assets that acted as collateral for loans issued were probably already taken into account in the damages of the relevant sectors of the economy (Annex 15).

ENVIRONMENT

As of June 21, the State Environmental Inspectorate recorded 330 events that pose a threat to the environment in Ukraine. Some damages to natural ecosystems and unique natural objects are already irreparable. The restoration of other damages (soils, forests, natural resources of flora and fauna in some areas) will take decades.

Given the significant number of indirect effects of hostilities on the environment, it is currently not possible to estimate the total amount of damages and losses. Below there are the key areas of impact of hostilities on the environmental situation in Ukraine, and where possible – their financial assessment.

Damage to the nature reserve fund and other protected areas

Damage to the nature reserve fund and other protected areas means the destruction and damage of natural ecosystems and objects due to fires, explosions, movements of equipment and military forces, various types of pollution, deterrence of rare and endangered animals, irreparable loss of old trees, other natural monuments, and especially rare animals and plants, loss of access and reduced attractiveness for tourism and research purposes, and the long-term unpredictable effects of the war on wildlife restoration.

As a result of hostilities, 812 wildlife sanctuaries of Ukraine are in danger. It is about 20% of the area of all protected territories in Ukraine. Hostile actions of the russian federation threatened to destroy 2.5 million hectares of protected areas: 160 objects of the Emerald Network and 17 Ramsar sites with an area of 627.3 thousand hectares. The Emerald Network sites are the areas of plant, animal and natural ecosystems and habitats that are protected at the European level. Ramsar sites are wetlands of international importance.

Territories and sites of the nature reserve fund of Ukraine are protected by law. According to the EcoZagroza website (official site of the Minustry of Ecology and Natural Resources), there are complaints about violations of the nature reserve fund caused by the actions of the occupants on the total area of 1.24 million hectares.

European biodiversity is dying from military equipment and explosions. These are many species of plants that are listed in the Red Book of Ukraine and are protected by law, as well as plants from the lists under the protection of international conventions. Hostilities disturb the peace of wild animals. They either die or try to escape from hotspots, leaving their traditional breeding places. Russia is fighting in protected areas of international and European importance, which destroys part of the European natural heritage and habitat of rare and endemic species.

Damage to forests

Damage to forests means the destruction and damage of stocks of standing timber and lumber, other components of forest ecosystems due to fires, explosions, etc., and as a result of occupation and mining – loss of access to logging, reforestation, other forestry measures, forest use, e.g., picking berries, mushrooms, etc., tourism and recreation. In addition, damage to forest causes complete or partial loss of its useful properties – absorption of greenhouse gases from the atmosphere, air purification, protection against erosion and landslides, water purification and replenishment, ensuring the life and reproduction of animals.

> Military actions are destroying Ukraine’s forests, which will also affect the global food security. Hostilities are fierce in the eastern and southern regions of Ukraine now. These regions are known to have low forest coverage. But even that amount of forests perform protective functions. Their destruction and damage will affect the local climate, lead to significant

erosion, and threaten significant crop losses in these regions. In particular, in the south of Ukraine, the aftermath may я **caused by hostilities**

As a result of hostilities, environmental security problems are becoming more complicated. Hazardous waste is generated due to destruction and military waste.

According to the State Emergency Service of Ukraine (SES), from February 24 to June 22, 2022, 143,287 explosives were neutralized in the territory of Ukraine, including 1,995 aviation bombs. The area of 61,809 hectares was surveyed.

According to the SES, the area of about 270,000 square kilometres needs demining in Ukraine now (including the occupied territories). Complete demining of areas contaminated with explosives will take 5-10 years.

Mine explosions lead to soil contamination with heavy metals – lead, strontium, titanium, cadmium, nickel. This makes the soil dangerous, and in some cases unsuitable for further agricultural use.

Currently there is no comprehensive assessment of demining needs, except estimates for the agricultural sector ($0.5 billion) and tourism ($0.2 billion). According to the World Bank's assessment, demining all territories (including forests and waterways) requires more than $70 billion.

Russia has fired more than 2,500 missiles at Ukraine since February 24. Shells, which hit critical infrastructure and housing in Ukraine on a daily basis, cause significant fires. This leads to significant air pollution with hazardous substances.

During the detonation of missiles and shells, a number of chemical compounds are formed, such as carbon monoxide, brown gas, nitrogen dioxide, formaldehyde, etc. During an explosion, all substances undergo complete oxidation, and the products of the chemical reaction are released into the atmosphere.

Damage from attacks on infrastructure and industrial facilities

Pollution occurs due to the destruction of transport and industrial infrastructure, which leads to large-scale spills of petroleum products and other hazardous substances.

The war damaged or destroyed at least 388 enterprises, plants and factories, including chemical enterprises. The activity of a number of mining enterprises had stopped, which led to a shortage of salt, coal and other minerals; the status of deposits and the possibility of their further development is questionable now.

There is a significant threat to nuclear and radiation safety due to the damaged nuclear and radiation-hazardous facilities (namely, due to the temporary occupation of the Zaporizhzhia Nuclear Power Plant and the Chornobyl Exclusion Zone). In the Exclusion Zone, the radiation monitoring system was destroyed; eight objects were destroyed and 142 objects were damaged. The aggressor’s troops destroyed almost 100 units of valuable analytical equipment, which has no analogues in Europe.

276 real estate objects of the State Forest Agency and 296 objects of the State Water Agency were destroyed or damaged. 194 minerals mining sites were seized. Moreover, 28 of such sites were destroyed or damaged.

Military waste (destroyed equipment, destroyed and used ammunition)

Losses incurred from accumulated military waste consist of 1) costs for their collection and removal, safe recycling and disposal, possibly for the construction of landfills or other facilities for this purpose, 2) loss of access to land and its intended use while these wastes are located on it, 2) costs of measures taken to eliminate (decontaminate) pollution of lands and waters, to restore the quality of lands, water bodies and natural ecosystems.

According to the EcoZagroza website, at least 199,652 tons of military waste have been accumulated as a result of the destruction of the aggressor's equipment. The longer they stay in the environment, the more they pollute soils, groundwater, rivers, water reservoirs, and vegetation. The composition of these wastes, their degree of toxicity, duration and persistence of pollution are not fully estimated and predicted yet.

Emissions of hazardous substances into the atmosphere

As a result of the destruction of military equipment, explosions, burning of oil products and other fires, a huge amount of hazardous substances was released into the atmosphere. Those are 26 thousand tons of destroyed enemy's equipment, 7.25 million tons of forest fires and fires at industrial facilities (according to EcoZagroza). Hazardous substances eventually either settle to the ground or degrade air quality and have a negative effect on global climate change.

Damage from emissions into the atmosphere must be compensated to the extent that would allow taking measures to clean up the environment and to prevent climate change and to adapt to it.

Damage to land resources

Direct damage means the destruction and damage of lands of various categories (not limited to agriculture) due to mine pollution and demining, pollution caused by burning and spilling of petroleum products, pollution from emissions of substances deposited on the ground, pollution by military waste, other hazardous substances as a result of military actions (for example, chemicals which were stored at industrial facilities), as well as the need for measures to rehabilitate lands damaged by explosions and heavy military equipment, and measures to eliminate (decontaminate) pollution and clean up the land.

Areas of contaminated and disturbed lands have not been determined yet. Furthermore, the amount of hazardous substances that contaminated soils and lands is unknown. At least 5,589 tons of oil products have been spilled into the soil (according to EcoZagroza), but precise assessment can be made only for oil storage facilities, while destroyed military equipment and civilian vehicles damaged by mines and shelling are also the sources of significant pollution of lands with petroleum products.

DRAFT

Annexes

Annex 1.

Residential housing

	Unit	Baseline, units	Damages, units	UAH bln	$ bln
Damages					
Destroyed					
Apartment buildings	pcs.	17921,0	4 063,0	60,1	2,2
Private houses	pcs.	8 984 976,0	37 205,0	487,5	17,9
Dormitories	pcs..	7 114,0	34,0	3,0	0,1
Damaged					
Apartment buildings	pcs.	178 921,0	9 067,0	45,1	1,7
Private houses	pcs.	8 984 976,0	70 557,0	406,1	14,9
Dormitories	pcs.	7 114,0	70,0	2,1	0,1
Total damages				***1 003,9***	***36,8***
Losses					
Increased expenditures to support the sector	x	x	x	4,7	0,2
Costs for dismantling and removal of construction waste	x	x	x	73,6	2,5

Total losses	x	***x***	***x***	***78,3***	***2,7***
Needs					
Need for repair and reconstruction of housing	x	x	x	1 614,0	55,2
Costs for dismantling and removal of construction waste				73,6	2,5
Increase in expenditures to support the sector	x	x	x	4,7	0,2
Total needs	***x***	***x***	***x***	***1 692,3***	***57,8***

Source: State Statistics Service, Ministry of Communities and Territories Development (Ukraine), Order of the Ministry of Regions dated February 17, 2022 No. 53, data of regional military administrations, official currency exchange rates of the NBU, market data; calculations of the Ministry of Regions and KSE

Annex 2.

.

Health care

	Unit	Baseline, units	Damages, units	UAH bln	$ bln
Damages					
Destroyed					
Hospitals	pcs	1135	32	12,5	0,458
Polyclinics and RCDCP	pcs	1131*	12	1,0	0,036
Outpatient clinics	pcs	1131*	54	0,9	0,032
Blood centres	pcs	28	2	0,1	0,004
Other (medical offices, laboratories, medical warehouses, dormitories, forensic medical examination bureaus)	pcs		22	0,4	0,016
Damaged					
Hospitals	pcs	1135	189	14,7	0,5
Polyclinics and RCDCP	pcs	1138*	86	1,5	0,1
Outpatient clinics	pcs	1138*	214	0,7	0,0
Blood centres	pcs	28	3	0,1	0,0
Other (medical offices, laboratories, medical warehouses, dormitories, forensic medical examination	pcs		163	4,0	0,1

bureaus)					
Total damages			***777***	***35,9***	***1,3***
Losses					
Decrease in revenue in the private sector due to the shutdown of institutions and a decline in demand	x	x	x	77,1	2,6
Reduction in planned budget expenditures	x	x	x	1,3	0,0
Total losses	***x***	***x***	***x***	***78,3***	**2,7**
Needs					
Reconstruction of the damaged/destroyed facilities			777	52,9	1,8
Compensation of a part of indirect losses in the amount necessary to restore the operational activities of private medical institutions	x	x	x	6,3	0,2
Total needs	***x***	***x***	***x***	***59,2***	***2,0***

Source: Data on the number of damaged state-owned health care facilities – Ministry of Health; Data on the number of damaged private health care facilities – public sources; Data on the cost of replacing one health care facility is calculated with several methods: (1) for facilities for which the number of square meters and/or beds is known, data of the Ministry of Regions is used on the average cost of construction of 1 square meter of health care facilities; (2) for institutions for which the number of square meters and/or beds is unknown, the results of tenders in the Prozorro system are used for the cost of ordering the construction of similar health care institutions in 2020-202; estimate of indirect losses in the sector calculated on the State Statistics Service database; as well as the decisions of the CMU regarding the redistribution of budget funds.

Annex 3.

Social sector

	Unit	Baseline, units	Damages, units	UAH bln	$ bln
Damages					
Damaged					
Orphanages, boarding schools, geriatric institutions	pcs	281	25	2.0	0.1
Social centres	pcs	no data	19	1.5	0.1
Sanatoriums/resorts, children's camps	pcs	1655	12	1.6	0.1
Total damages			***56***	***5.1***	***0.2***
Losses					
The need for social benefits based on the number of IDPs and other categories of citizens who additionally need social support as of June 1, 2022	x	x	x	186.4	6.4
Total losses	***x***	***x***	***x***	***186.4***	***6.4***
Needs					
Needs to restore damaged and destroyed physical assets	x	x	x	6.2	0.2
Extra budget expenditures for social support of the population ***	x	x	x	186.4	6.4
Total needs	***x***	***x***	***x***	***192.7***	***6.6***

Source: the number and cost of damaged facilities – Ministry of Regions; the amount of needs for additional expenditures on social protection – Ministry of Social Policy; KSE calculations

* The number of damaged facilities and their estimated value according to the Ministry of Communities and Territories Development

** Information on needs for additional funds for social benefits according to the Ministry of Social Policy

*** Calculation of the extra needs based on the number of additional (compared to the pre-war number) recipients of social benefits, as of June 1, 2022; the number of recipients exceeding this amount will depend on the dynamics and duration of hostilities

Annex 4.

Educational institutions and scientific infrastructure

	Unit	Baseline, units	Damages, units	UAH bln	$ bln
Damages					
Destroyed					
Institutions of secondary education	pcs	13991	109	11,6	0,424
Pre-school education institutions	pcs	15335	50	2,9	0,107
Vocational schools	pcs		9	2,6	0,095
Institutions of higher education	pcs	515	8	1,6	0,057
Institutions of professional pre-higher education	pcs	129	7	0,9	0,032
Institutions of extracurricular education	pcs		8	1,1	0,042
Institutions of specialized education	pcs		1	0,1	0,005
Institutions of special education	pcs		4	0,4	0,016
Damaged					
Institutions of secondary education	pcs	13991	852	36,1	1,324

Pre-school education institutions	pcs	15335	640	15,0	0,550
Vocational schools	pcs		99	11,4	0,418
Institutions of higher education	pcs	515	38	4,7	0,173
Institutions of professional pre-higher education	pcs	129	61	3,1	0,112
Institutions of extracurricular education	pcs		47	2,7	0,099
Institutions of specialized education	pcs		23	1,2	0,042
Institutions of special education	pcs		15	0,6	0,023
Scientific institutions	pcs	*213**	90**	0,2	0,008
***Total* damages**	x		x	***96,2***	**3,527**
Losses					
A decrease in revenues in the private sector due to the shutdown of the operation and a decline in demand	x	x	x	14,2	0,485
A decrease in revenues of scientific institutions due to a decrease in revenues from rent**	x	x	x	0,1	0,005
Reduction in planned budget expenditures	x	x	x	46,6	1,592
Total losses	***x***	***x***	***x***	***60,9***	***2,082***
Needs					
Needs for recovery of physical	x	x	x	119,0	4,069

assets					
Compensation of a part of indirect losses in the amount necessary to restore the activities of educational institutions	x	x	x	9,6	0,729
Total needs	***x***	***x***	***x***	***128,6***	***4,397***

Source: Ministry of Education and Science; Ministry of Regions; National Academy of Sciences of Ukraine; calculations of KSE

* the number presented is according to the State Register of scientific institutions that receive state support; the list is not complete. http://rnib.rit.org.ua/rni?page=4
** currently, it includes assessment only of damaged institutions of National Academy of Sciences of Ukraine; the assessment of losses of other scientific institutions will be carried out during the next steps

DRAFT

Annex 5.

Culture, religion, sports, and tourism

	Unit	Baseline, units	Damages, units	UAH bln	$ bln
Damages					
Destroyed					
Religious institutions	pcs	no data	17	1,4	0,1
Sports facilities	pcs	16199	24	2,4	0,1
Youth centres	pcs.	no data	5	0,01	0,00
Cultural sector	pcs	34340	280	9,6	0,4
Tourism	pcs	no data	28	0,3	0,0
Damaged					
Religious institutions	pcs	no data	19	0,8	0,0
Sports facilities	pcs	16199	71	1,7	0,1
Youth centres	pcs	no data	23	0,01	0,0
Cultural sector	pcs	34340	247	5,6	0,2
Tourism	pcs	no data	21	0,1	0,0
Total damages			**683**	***21,9***	***0,7***
Losses					
Decrease in revenues in the culture and sports sectors	x	x	x	15,5	0,5
Decrease in revenues in tourism	x	x	x	110,8	3,8
Total losses	***x***	***x***	***x***	***126,3***	***4,3***
Needs					
Repair and reconstruction of damaged assets in the culture sector	x	x	x	20,7	0,7
Repair and reconstruction of damaged assets in the sports	x	x	x	4,9	0,1

sector					
Repair and reconstruction of damaged religious objects	x	x	x	3,0	0,1
Repair and reconstruction of objects in tourism	x	x	x	0,4	0,0
Compensation of a part of indirect losses for the support and restoration of enterprises in the culture sector	x	x	x	3,1	0,1
Compensation of a part of indirect losses for the support and restoration of enterprises in the tourism sector	x	x	x	11,1	0,4
Costs for surveying the coastal tourist zone in terms of demining	ha	x	2 000 000,00	0,9	0,0
Costs for demining the coastal tourist zone	ha	x	200 000,00	4,4	0,2
Total needs	***x***	***x***	***x***	***48,5***	***1,6***

Source: Data of the Ministry of Regions on the number and value of damaged objects; Data of State Statistics Service on the initial number of objects; other – calculations of KSE

Annex 6.

Extra amount of funds to cover social payments based on the calculations per month, based on the number of additional recipients of social aid as a result of the war, as of June 1, 2022

Name of the budget program	Number of recipients of social aid; thousands of people	Extra amount of funds, UAHbln
CPCEC 2501030 “Payment of certain types of benefits, compensations, financial support and payment of services to certain categories of the population”	8.5	0.4
CPCEC 2501150 “Annual one-time monetary assistance to war veterans and victims of Nazi persecution and social assistance to persons who have special and special labour merits to the Motherland”	63.4	0.1
CPCEC 2501480 “Provision of monthly targeted assistance to internally displaced persons to cover living expenses, including payment of housing and communal services”	562	8.4
Total	633.4	8.9

DRAFT

Annex 7.

The largest affected industrial assets (according to available information on the damaged assets)

Item	Enterprise	Industry	Status	Damages, $ million
1	Ilyich Iron and Steel Plant	Metallurgy	Destroyed	1,959
2	Azovstal	Metallurgy	Destroyed	1,494
3	Ukrainian Energy Machines	Machine engineering	Destroyed	432
4	Antonov	Aircraft engineering	Damaged	159
5	Ukrtatnafta	Oil refining	Damaged	155
6	Avdiiv Coke Chemical Plant	Coke and chemical	Damaged	142
7	Zorya – Mashproekt	Machine engineering	Destroyed	141
8	Vetropak Gostomel Glass Factory	Production of glass	Destroyed	95
9	Rubizhansky Cardboard and Packaging Mill	Paper production	Destroyed	86
10	Energomashspetsstal	Machine engineering	Damaged	74
11	Odesa Oil Refinery	Oil refining	Damaged	71
12	Severodonetsk Association “Azot”	Chemical industry	Damaged	67
13	Coca-Cola Beverages Ukraine	Production of beverages	Damaged	62
14	Pharmak (products warehouse)	Pharmaceuticals	Damaged	53
15	Kub-Gas	Gas production	Destroyed	48

DRAFT

Annex 8.

Industry and business services

	Unit	Baseline, units	Damages, units	UAH bln	$ bln
Damages					
Destroyed					
Large and medium-sized private enterprises	pcs	5270	10	107,0	3,9
Small private enterprises	pcs	78060	no data	43,3	1,6
State-owned enterprises	pcs	1665	18	17,9	0,7
Damaged					
Large and medium-sized private enterprises	pcs	5270	30	21,6	0,8
Small private enterprises	pcs	78060	no data	17,3	0,6
State-owned enterprises	pcs	1665	330	11,8	0,4
Total Damages	***x***	***x***	***x***	***219,1***	***8,0***
Losses					
Decrease in revenues of large and medium-sized private enterprises	x	x	x	411,2	14,1
Decrease in revenues of small private enterprises	x	x	x	143,4	4,9
Decrease in revenues of state-owned enterprises	x	x	x	41,6	1,4
Decrease in revenues of certain industries at the national level	x	x	x	223,2	7,6
Total losses	***x***	***x***	***x***	***819,5***	***28,0***
Needs					
Reconstruction of damaged/destroyed facilities	x	x	x	306,7	11,2
Compensation of a part of indirect losses in the amount necessary to support/restore the activity of enterprises	x	x	x	163,9	5,6

Total needs	***x***	***x***	***x***	***470,6***	***16,8***

Sources: information on the destruction of individual facilities, municipality (level of destruction in the cities), State Statistics Service; calculations of KSE

DRAFT

Annex 9.

Retail

	Unit	Baseline, units	Damages, units	UAH bln	$ bln
Damages					
Destroyed				39,6	1,3
Shops	pcs	26000	796	25,5	0,9
Shops	pcs	no data	9	3,6	0,1
Gas stations	pcs	7000	123	2,7	0,092
Pharmacies	pcs	12400	238	0,5	0,0
Shopping malls according to ICSC classification	pcs	329	8	7,3	0,2
Damaged				21,1	0,7
Shops	pcs	26000	1195	15,3	0,5
Warehouses	pcs	no data	5	0,8	0,0
Gas stations	pcs	7000	182	1,6	0,1
Pharmacies	pcs	12400	355	0,3	0,0
Shopping malls according to ICSC classification	pcs	329	15	3,1	0,1
Total damages	x	x	x	***60,7***	***2,1***
Losses					
Lost revenue of retail	x	x	x	631,3	21,6
Lost revenue of shopping malls	x	x	x	50,2	1,7
Total losses	***x***	***x***	***x***	**681,5**	**23,3**
Needs					
Repair and reconstruction of retail outlets	x	x	x	67,9	2,3
Repair and reconstruction of	x	x	x	10,4	0,3

shopping malls					
Resumption of work of retail outlets	x	x	x	36,1	1,2
Total needs	***x***	***x***	***x***	114,3	3,9

Sources: State Statistics Service, Ukrainian Council of Shopping Centres, Retail Association of Ukraine

Annex 10.

Agri sector and land resources

	Unit	Baseline, units	Damaged, units	UAH bln	$ bln
Damages					
Totally Damaged					
Mining pollution - technical inspection, demining	ha	28387500	594456	10,1	0,3
Recultivation of lands	ha	28387500	198152	0,3	0,0
Unharvested winter crops	ha	9093100	2391935	42,0	1,4
Irrigation systems	ha	1819800	53533	4,7	0,2
Agricultural machinery	pcs	764323	14581	19,3	0,7
Storage facilities	volume, thousands of tons	75084	1297	5,7	0,2
Livestock (including poultry)	heads, thousands	203292	6095	4,0	0,1
Destroyed beehives	bee colonies	2272740	110375	0,8	0,0
Perennial crops	ha	197100	2623	1,9	0,1
Destroyed and stolen inputs	ton	962951	174861	3,5	0,1
Destroyed and stolen grain and oilseeds	ton	25486613	1194458	17,9	0,6
Partially Damaged					
Mining pollution – non-technical inspection	ha	28387500	5944555	2,6	0,1
Recultivation of lands	ha	28387500	1981518	0,9	0,0
Irrigation systems	ha	1819800	107065	1,9	0,1
Killed and missing bees	bee colonies	2272740	304954	0,4	0,0
Agricultural machinery	pcs	764323	29162	7,7	0,3
Storage facilities	volume,	75084	2595	2,3	0,1

	thousands of tons				
Perennial crops	ha	197100	5246	0,7	0,0
Total damages	**x**	**x**	**x**	***126,8***	***4,3***
Losses					
Lower crop production (annual and perennial crops)	*x*	*x*	*x*	288,1	9,9
Lower livestock and beekeeping production	*x*	*x*	*x*	20,6	0,7
Decrease in domestic prices for key export-oriented commodities caused by the naval blockade	*x*	*x*	*x*	349,1	11,9
Higher cost of production because of an increase in input prices	*x*	*x*	*x*	25,1	0,9
Total losses	***x***	***x***	***x***	***683,0***	***23,4***
Needs					
Replacement and restoration of damaged assets	x	x	x	130,0	4,4
Support for the production recovery	x	x	x	274,9	9,4
Liquidity support to banks for agricultural financing	x	x	x	26,7	0,9
Supporting Agricultural Public Institutions for Service Delivery (for the next 10 years, without adjustments for inflation)	x	x	x	80,9	2,8
Total needs	***x***	***x***	***x***	***512,4***	***17,5***

Source: calculations of KSE's Agrocenter (Food and Land Use Research Center)

DRAFT

Annex 11.

Vehicles

	Unit	Baseline, units	Damages, units	UAH bln	$ bln
Damages					
Damaged/Destroyed					
Trolleybuses*	pcs	2980	341	0,9	0,03
Trams*	pcs	1922	151	5,0	0,2
Buses	pcs	241426	16838	21,0	0,8
Passenger cars **	pcs, million	10,10	105190	28,5	1,0
Fire trucks	pcs	4216	623	0,9	0,03
An-225 Mriia aircraft	pcs	1	1	8,2	0,3
Total damages	**pcs**		**123144**	64,5	**2,4**
Losses					
Decrease in revenues in the sector of communal and long-distance passenger transportation in the affected regions	x	x	x	5,9	0,2
Total losses	***x***	***x***	***x***	***5,9***	**0,2**
Needs					
Restoration of the trolleybus fleet of the ME	x	x	x	1,8	0,1
Restoration of the tram fleet of the ME	x	x	x	10,1	0,3
Restoration of the bus fleet	x	x	x	53,6	1,8
Passenger cars	x	x	x	52,3	1,8
Mriia aircraft				15,6	0,5
Fire trucks	x	x	x	1,9	0,06
Total needs	***x***	***x***	***x***	***135,3***	**4,6**

Source:
The number of cars registered in Ukraine https://dostup.pravda.com.ua/request/statistika_kilkosti_zarieiestrov;
Data on losses of municipal transport for four regions (Kharkivska, Donetska, Luhanska, Dnipropetrovska) – information of military-civilian administrations; for other areas – KSE's assumptions
data on the trolleybus and tram fleet http://www.ukrstat.gov.ua/druk/publicat/kat_u/2021/zb/10/zb_Transpot.pdf
data on the bus fleet https://dostup.pravda.com.ua/request/statistika_kilkosti_zarieiestrov
Data on the cost of restoration of the Mriia aircraft – data of Ukroboronprom
**only officially registered private cars are taken into account, excluding cars imported without customs clearance into the territory of Ukraine
***at the current stage, the following are not taken into account: (1) loss of trucks; (2) loss of other transport vehicles, in particular those belonging to authorities; (3) loss of aircrafts (except for the Mriia aircraft, the information on its loss is publicly available)
The assumption for the calculation is that the average cost of replacing one unit of public transport is 1/3 of the replacement cost (the cost of purchasing similar objects on Prozorro tenders in 2021, at the exchange rate valid at the end of 2021). For buses: we take the average between the cost of a bus and a minibus as the exact structure of the bus fleet (distribution between large buses and minibuses) is not known.

DRAFT

Annex 12.

Infrastructure

	Unit	Baseline, units	Damages, units	UAH bln	$ bln
Damages					
Destroyed					
Airports	pcs	34	9	47,1	1,7
Property of postal operators	x	x	x	0,1	0,002
Damaged					
Public roads, bridges and overpasses on them	km	69.7 thous. km	12 185	353,4	13,0
Communal/municipal roads (in the cities and other settlements)	km	260 thous. km	11 664	338,3	12,4
Assets of Ukrainian Railways	various	no data	-	85,8	3,1
Infrastructure of seaports and inland water transport (ports; wharves; warehouses; terminals; movable property)	various	no data	-	13,8	0,5
Airports	pcs	34	9	9,1	0,3
Air bases	pcs	1	1	1,1	0,04
Ukraerorukh	pcs	no data	1	4,6	0,2
Property of postal operators		x	x	0,3	0,01
Total damages				**853,5**	**31,3**

Losses					
Decrease in the industry revenue (Avia)	x	x	x	154,7	5,3
Decrease in the industry revenue (UR)	x	x	x	112,3	3,8
Costs for (re)evacuation of the population, transportation of humanitarian aid, assistance to employees/their families involved in the war (UR)	x	x	x	17,2	0,6
Reduction of expenditures on road construction (forecast for 18 months, starting from June 2022)	x	x	x	145,7	5,0
Decrease in revenue of ports and other subjects of inland water transportation	x	x	x	80,3	2,7
Decrease in revenue of postal operators	x	x	x	7,8	0,3
Total losses	x	x	***x***	**517,9**	**17,7**
Needs					
Reconstruction and restoration of roads, bridges and overpasses according to the new standards (the forecast volume for 5 years, taking into account multi-year inflation)	x	x	x	913,3	31,2
Replacement and restoration of damaged assets (UR)	x	x	x	115,3	3,9
Expansion of the infrastructure capacity in the Ukraine-EU connection (UR)	x	x	x	17,1	0,6
Compensation of a part of indirect losses of UR	x	x	x	22,9	0,8
Ensuring the activities of the aviation industry enterprises during the period	x	x	x	37,5	1,3

Aviation projects for the recovery of operation, development and increase in the industry's safety, reconstruction/construction of 5-7 regional airports during the first 5 years after the war + other airports – during 5 years after that	x	x	x	86,4	3,0
Restoration and repair of the infrastructure of seaports and inland water transport (ports; wharves; warehouses; terminals; movable property)	x	x	x	13,8	0,5
Restoration of work of sea ports	x	x	x	16,1	0,5
Restoration and repair of the infrastructure of postal operators	x	x	x	0,5	0,02
Total needs	***x***	***x***	***x***	**1 223,0**	**41,8**

Source: Road management – calculations of KSE; Railway transportation – data and calculations of UR, calculations of KSE; Aviation industry – official statistical data, public data, calculations of KSE; Infrastructure of sea ports and inland water transport - MIU data; Postal operators – Nova Poshta, Ukrposhta; calculations of KSE.

Annex 13.

Digital infrastructure

	Unit	Baseline, units	Damages, units	UAHbln	$bln
Damages					
Damaged					
Fixed-line operators	pcs	4162	726	9,3	0,3
Mobile operators	x	x	x	6,1	0,2
Total damages	x	x	x	**15,4**	**0,6**
Losses					
Decrease in revenues of fixed-line operators	x	x	x	9,4	0,3
Decrease in revenues of mobile operators	x	x	x	22,7	0,8
Total losses	***x***	***x***	***x***	**32,1**	**1,1**
Needs					
Restoration of the infrastructure of communication operators	x	x	x	21,6	0,8
Restoration of the activity of communication operators	x	x	x	6,4	0,2
Total needs	***x***	***x***	***x***	**28,0**	**1,0**

Source: Ministry of Digital Transformation, NKRZI (the National Commission that carries out state regulation in the field of communication and informatization), communication operators

DRAFT

Annex 14.

Energy sector

	Unit	Baseline, units	Damages, units	UAHbln	$bln
Damages					
Destroyed					
CHPP	Pcs	87	3	2,399	0,088
Oil bases	Pcs	no data	28	7,4	0,3
VDE (renewable energy industry)	MW	8451	36	0,9	0,0
Damaged					
CHPP	Pcs	87	5	0,436	0,016
Electric distribution networks	km	820 145	no data	15,4	0,6
Main power grids	Km	24 327	218*	7,7	0,3
Gas transportation	Km	289 111	180*	5,1	0,2
Gas distribution	Km	38 550	7453*	6,1	0,2
Other assets	Various	no data		4,2	0,2
Total damages				***49,5***	***1,8***
Losses					
Loss of revenues in the electric power sector	x	x	x	214,5	7,3

Loss of revenues in gas production and gas supply	x	x	x	61,2	2,1
Loss of revenues in oil production and oil refining	x	x	x	64,6	2,2
Total losses	***x***	***x***	***x***	***340,3***	***11,6***
Needs					
Replacement and restoration of damaged assets				69,3	2,4
Compensation of a part of indirect losses in the amount necessary for the restoration of production by industry enterprises	x	x	x	34,0	1,2
Total needs	***x***	***x***	***x***	***103,4***	***3,5***

Source: Ministry of Energy; Ukrenergo; OGTSU, State Statistics Service; calculations of KSE

* - number of incidents

Annex 15.

Financial sector

Type of losses	Unit	Baseline, units	Damages, units	UAHbln	$bln
Damages					
Destroyed/ Damaged*					
Immovable property of banks	UAHbln	28,8	no data	0,112	0,004
Investment assets of banks	UAHbln	6,124	no data	0,002	0,000
Unfinished capital investment of banks in construction	UAHbln	1,273	no data	0,000	0,000
Property received by banks as collateral	UAHbln	4,277	no data	0,040	0,001
Cash in the bank branches	UAHbln	78 333,00	0,470	0,470	0,016
Total damages	***x***	***x***	***x***	**0,624**	**0,021**
Losses					
Evacuation of the personnel by banks from the territories involved in hostilities	x	x	x	no data	no data
Losses from realization of operational risks due to war[8]	x	x		6	0,205
Total losses	***x***	***x***	***x***	***6,0***	***0,205***
Needs					

[8] Some components of losses are not reflected in the report on financial results, in particular, lost revenues; include losses from damage or loss of property, banknotes.

Reconstruction of damaged/destroyed real estate objects [9]	x	x	x	0,7	0,023
Additional support for banks' liquidity during the crisis period	x	x	x	no data	no data
Total needs	***x***	***x***	***x***	***0,7***	***0,023***

Source: National Bank of Ukraine; Financial Stability Report, June 2022
https://bank.gov.ua/admin_uploads/article/FSR_2022-H1.pdf?v=4

* at the current stage, only data on bank losses are included in the Section, excluding direct and indirect losses to other financial institutions

[9] Estimates of the value of property located in the territory which is not under control of banks, and there is a high probability that it may be damaged or destroyed, but it is not reflected as losses yet.

DRAFT

Annex 16.

Utilities

Type of losses	Unit	Baseline, units	Damages, units	UAHbln	$bln
Damages					
Destroyed					
CHPP	pcs	87	3	included in another section	
Boiler/heating premises	pcs	19 025	71	0,955	0,035
Thermal networks	thousand running meters	18,987,083	222.358	13,230	0,485
Central thermal points	pcs	5 523	43	0,491	0,018
Water treatment facilities	pcs	400	2	0,113	0,004
Sewage treatment facilities	pcs	967	4	0,350	0,013
Water pumping stations	pcs	5 646	18	0,378	0,014
Sewage pumping stations	pcs	2 908	19	0,644	0,024
Water supply networks	thousand running meters	98,076.47	816.314	6,121	0,224
Sewage networks	thousand running meters	37,053.2	241.665	8,464	0,310
Wells	pcs	22 134	13	0,011	0,000

Laboratories	pcs	no data	2	0,010	0,000
Clean water reservoirs	pcs	2 129	12	0,215	0,008
Water towers	pcs	6 947	24	0,120	0,004
Containers for collecting household waste	pcs	no data	17 439	0,296	0,011
Garbage trucks	pcs	3 669	172	0,946	0,035
Landfills for disposal of household waste	pcs	5 969	9	0,742	0,027
Garbage sorting lines	pcs	34	3	0,123	0,005
Container sites	pcs	no data	231	0,006	0,000
Biogas equipment/premises	pcs	18	3	0,139	0,005
Damaged					
CHPP	pcs	87	5	included in another section	
Boiler/heating premises	pcs	19 025	258	1,364	0,050
Thermal networks	thousand running meters	18,987,083	0	0,000	
Central thermal points	pcs	5 523	56	0,246	0,009
Water treatment facilities	pcs	400	8	0,191	0,007
Sewage treatment facilities	pcs	967	10	0,355	0,013
Water pumping stations	pcs	5 646	20	0,164	0,006

Sewage pumping stations	pcs	2 908	32	0,436	0,016
Water supply networks	thousand running meters	98,076.47			
Sewage networks	thousand running meters	37,053.2			
Wells	pcs	22 134	11	0,000	0,000
Laboratories	pcs	no data	3	0,000	0,000
Clean water reservoirs	pcs	2 129	4	0,027	0,001
Water towers	pcs	6 947	8	0,027	0,001
Containers for collecting household waste	pcs	no data			
Garbage trucks	pcs	3 669			
Landfills for disposal of household waste	pcs	5 969	4	0,132	0,005
Garbage sorting lines	pcs	34			
Container sites	pcs	no data	87	0,001	0,000
Biogas equipment/premises	pcs	18			
Total damages				***36,296***	***1,331***
Losses					
Decrease in revenues in the industry	x	x	x	68,579	2,344

Total losses	***x***	***x***	***x***	***68,579***	***2,344***
Needs					
Needs for recovery of physical assets	x	x	x	45,370	1,551
Needs for business recovery (compensation for lost revenue)	x	x	x	3,919	0,134
Total needs	***x***	***x***	***x***	***49,3***	***1,7***

Source: data of the State Statistics Service, data of the Ministry of Communities and Territories Development (Ukraine), data of regional military administrations, official currency exchange rates of the NBU, market data, expert assumptions, etc.